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Chicken/Werner
Timber Sale Project
Final Environmental
Impact Statement

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CHICKEN/WERNER TIMBER HARVEST PROJECT

June 1999

Draft Environmental Impact Statement Summary

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ACRONYMS

A.C.B.	Montana State University Grant
A.C.I.	Montana State University - Morrill Grant
ARM	Administrative Rules of Montana
BF	board feet
BMP	Best Management Practices
BMU	Bear Management Unit
CCC	Civilian Conservation Corps
C.S.	Common School Grant
dbh	Diameter at breast height
D.D.&A	Deaf Blind School Grant
DEIS	Draft Environmental Impact Statement
DEQ	Department of Environmental Quality
DF	Douglas-fir
DFWP	Montana Department of Fish, Wildlife and Parks
DNRC	Department of Natural Resources and Conservation
EA	Environmental Assessment
ECA	equivalent clearcut acres
EIS	Environmental Impact Statement
ES	Engelmann spruce
FEIS	Final Environmental Impact Statement
FI	forest improvement
FNF	Flathead National Forest
FRTA	Federal Road and Trail Act
ID Team	Interdisciplinary Team
KNF	Kootenai National Forest
LP	lodgepole pine
MBF	thousand board feet
MC	mixed conifer
MCA	Montana Codes Annotated
MEPA	Montana Environmental Protection Act
MMBF	million board feet
NCDE	Northern Continental Divide Ecosystem
NWLO	Northwestern Land Office
OSHA	Occupational Safety and Health Administraton
PCTC	Plum Creek Timber Company
POR	percent of open roads
PP	ponderosa pine
PTR	percent of total roads
RV	residual value
SAF	subalpine fir
SFLMP	State Forest Land Management Plan
SLI	stand-level inventory
SMZ	streamside management zone
SSFI	sale-specific forest improvement
TMDL	total maximum daily load
TPA	trees per acre
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USFS	United States Forest Service
WL	western larch
WWP	western white pine
WYI	water yield increase

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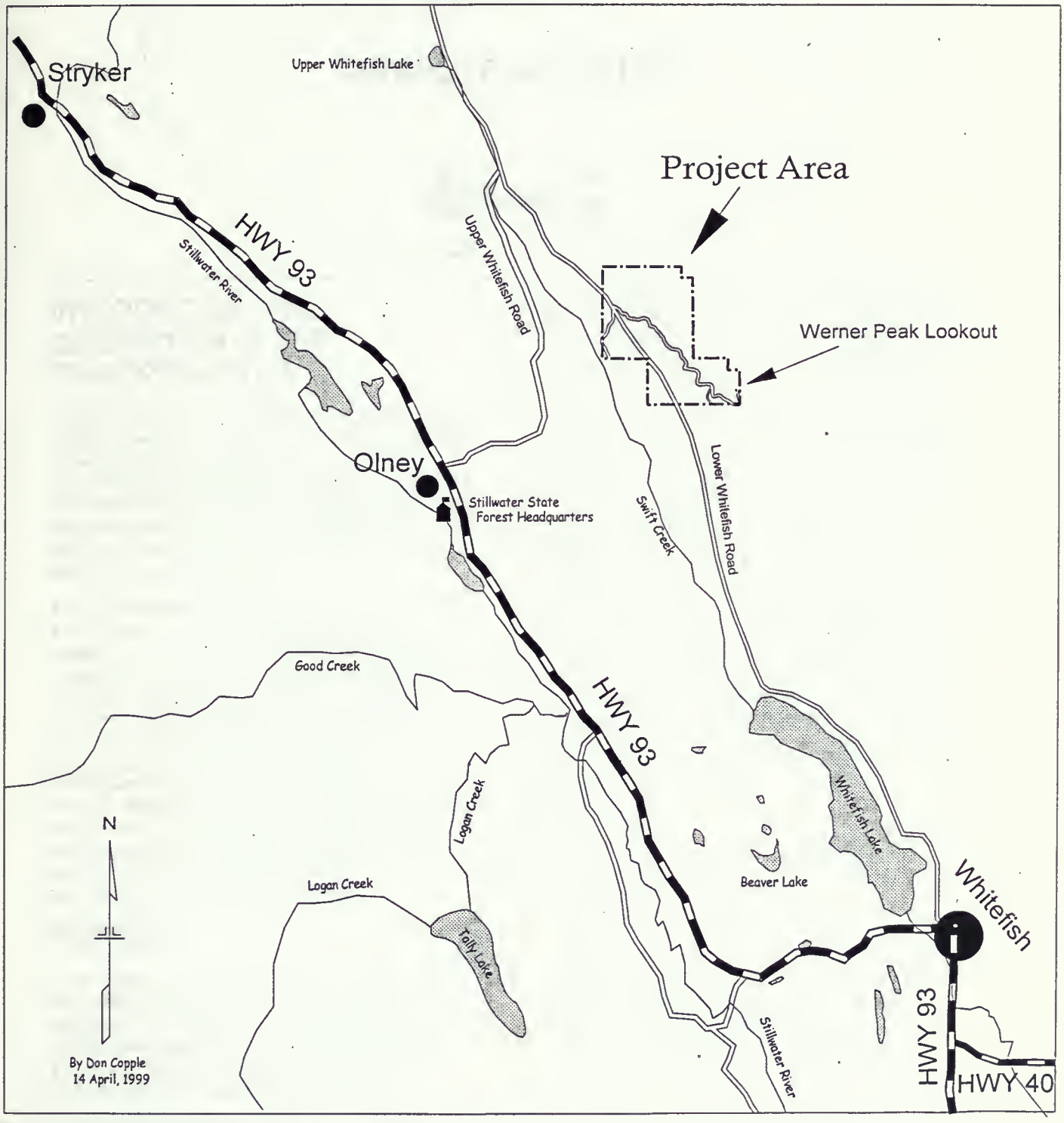
Chicken/Werner Project Vicinity



CHAPTER I

PURPOSE AND NEED

INTRODUCTION AND DESCRIPTION OF THE PROPOSED ACTION

Stillwater State Forest, Montana Department of Natural Resources and Conservation (DNRC) proposes the Chicken/Werner Timber Sale. Timber harvesting and drainage and safety improvements on existing roads are the primary activities associated with this project.

If a harvest alternative was selected, 3 to 5 million board feet (MMBF) of timber would be harvested from 692 to 1,262 acres, depending on the alternative. The general project area is located between Swift Creek and Werner Peak, approximately 14 air miles northwest of Whitefish and includes State lands in all or portions of Sections 19, 20, 29, 30, 32, and 33 in Township 33 north, Range 22 west. The project area encompasses approximately 3,752 acres.

PURPOSE

The lands involved in the proposed project are held by the State of Montana in trust for the support of specific beneficiary institutions, such as public schools, State colleges and universities, and other specific State institutions, such as the school for the deaf and blind (*Enabling Act of February 22, 1889; 1972 Montana Constitution, Article X, Section 11)*. The Board of Land Commissioners and DNRC are required by law to administer these trust lands to produce the largest measure of reasonable and legitimate return over the long run for these beneficiary institutions, *Section 77-1-202, Montana Codes Annotated (MCA)*. On May 30, 1996, DNRC released the Record of Decision on the State Forest Land Management Plan (SFLMP). The Land Board approved the SFLMP's implementation on June 17, 1996. The SFLMP outlines the management philosophy of DNRC in the management of State forested trust lands and sets out specific Resource Management Standards for 10 resource categories.

The Department will manage the lands involved according to the philosophy and standards in the SFLMP, which states:

> *Our premise is that the best way to produce long-term income for the trust is to manage intensively for healthy and biologically diverse forests. Our understanding is that a diverse forest is a stable forest that will produce the most reliable and highest long-term revenue*

stream...In the foreseeable future, timber management will continue to be our primary source of revenue and our primary tool for achieving biodiversity objectives.

PROPOSED OBJECTIVES

In order to meet the goals of the management philosophy adopted through a programmatic review of the SFLMP, DNRC has set the following specific project objectives:

- Harvest 3 to 5 MMBF of sawtimber and small roundwood to generate revenue for the appropriate school trusts.
- Move the forest toward appropriate or desired future conditions characterized by the proportion and distribution of forest types and structure historically present on the landscape.
- Improve the long-term productivity of the timber stands by increasing vigor, reducing incidence of diseases and insect infestations, and regenerating portions of the stands where the timber-stand growth is decreasing. Actions would be done in a manner that maintains site productivity and favors the retention and regeneration of appropriate species mixes. Harvesting would be done to reduce the hazard of heavy fuel loading and risk of large wildfires that would be difficult to control.
- Provide for additional benefits and maintain options for sustained revenue to the school trusts by:
  - completing site improvements on existing roads to improve drainage, water quality, and safety to meet current Best Management Practice (BMP) Standards;
  - Improving seasonal management of motorized travel for existing roads to provide wildlife security and allow better control of unseasonable use of roads, thereby protecting water quality and the State's investment in the roads; and
  - reducing the spread of noxious weeds with a monitoring and treatment program.

RELATIONSHIP TO THE SFLMP

The SFLMP is a programmatic plan that provides field personnel with consistent policy, direction, and guidance for the management of State forested lands. It contains the general philosophies and management standards that will provide the framework for project-level decisions.

The planning of the proposed Chicken/Werner Project was guided by the SFLMP. The SFLMP philosophy and appropriate resource-management standards have been incorporated into the design of the proposed actions. The Chicken/Werner Environmental Impact Statement (EIS) is not intended as a programmatic or area plan and is limited to addressing specific proposed actions in reference to issues that were identified through public and interdisciplinary team (ID Team) input.

EIS PROCESS

EIS DEVELOPMENT

The EIS was prepared in compliance with the Montana Environmental Policy Act (MEPA). MEPA requires State government to include consideration of environmental impacts into its decisionmaking process. It also requires agencies to inform the public and other interested parties of proposed projects, environmental impacts that may result, and alternative actions that could achieve the project's objectives.

PUBLIC SCOPING

The initial stage of an EIS is the public scoping process, which is used to:

- inform the public that a State agency is proposing an action and
- gather comments or concerns about the possible impacts of the project.

Two public-comment periods have taken place:

- DNRC solicited public participation in the Chicken/Werner Timber Sale Project on May 20, 1997, by advertising the proposed action in Kalispell's *Daily Interlake Newspaper*. A letter describing the proposed project was sent by mail to individuals, agencies, industry representatives, and other organizations that have expressed interest in Stillwater State Forest's management activities. The mailing list developed for this project is located in the project file.

  Initial concerns and comments on DNRC's proposal were requested. Concerned individuals and organizations were allowed 30 days to respond. The issues and concerns identified through public scoping are summarized in this chapter; the original comments are located in the project file at the Stillwater Unit Office in Olney, Montana.

- The second public-comment period was initiated in a newsletter on February 25, 1999. The newsletter summarized the comments and concerns received during the initial scoping and identified 5 management alternatives for the Chicken/Werner Timber Sale Project area. This second 30-day comment period allowed the public to provide input, which was taken into consideration before the alternative-development process and effects analysis were completed.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS)

DNRC's next step was to prepare this DEIS. Public comments related to issues that could affect the project were incorporated into the document. Upon publication, the DEIS will be circulated to interested parties; notification that it is available will be sent to the parties on the mailing list. Comments will be accepted for 30 days.

FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

After public comments on the DEIS are received and evaluated, DNRC will prepare an FEIS or adopt the DEIS as the FEIS. The FEIS consists primarily of a revision of the DEIS that incorporates new information, based on public and internal comments.

NOTIFICATION OF DECISION

Following publication of the FEIS, the Unit Manager of Stillwater State Forest will review public comments, the FEIS, and the information contained in the project file. No sooner than 15 days after publication of the FEIS, the Unit Manager will consider and determine the following:

- Do the alternatives presented in the FEIS meet the project's purpose?

- Is the proposed mitigation adequate and feasible?

- Which alternative or combination/ modification of alternatives should be implemented? Why?

These determinations will be published and all interested parties will be notified. The decisions presented in the published document would become recommendations by DNRC to the State Land Board. Ultimately, the State Land Board

would make the final decisions regarding which actions to implement.

PROPOSED SCHEDULE OF ACTIVITIES

After a decision is published, and if a timber-harvest alternative is selected, a Timber Sale Contract package would be prepared during the summer and fall of 1999 for the timber harvest and proposed road improvements.

This package is tentatively scheduled for presentation to the State Land Board in April, 2000. If the Land Board approves the timber sale, it would be advertised for sale that summer. Harvesting and road-construction activities would occur over approximately 3 years. Postharvest activities, such as site preparation, planting, and hazard reduction, would occur following the harvesting activities.

OTHER ENVIRONMENTAL REVIEWS RELATED TO THE PROJECT

In order to address indirect, direct, and cumulative effects on a landscape level, the analysis must incorporate past, present, and future timber sales within the analysis area. The following timber sales are located within the Chicken/Werner environmental analysis area for the vegetation analysis on Stillwater State Forest. The environmental analysis area for watershed, wildlife, soils, fisheries, and economics is smaller and encompasses an area specific to those disciplines.

- Timber sales where the environmental analysis has been completed and sale activities have begun, but are not completed:
  - Upper Stryker Ridge II Timber Sale (EIS completed in 1996)
  - Spring/Rock Timber Sale (Environmental Assessment (EA) completed in 1997)
  - Edmonds CT Timber Sale (EA completed in 1998)
- Timber sale where the environmental analysis has been completed, but sale activities have not yet begun:

  Beaver Lake Project (EIS completed in 1999)
- Timber sale proposal where environmental review is in progress:

  Taylor South Timber Sale - The project area is adjacent to the south boundary of the Chicken/ Werner Project area. Some initial public scoping has taken place; however, proposed actions have not been defined in detail.

The Good/Long/Boyle, West Fork, and Dog/Meadow proposed timber sale projects have been identified on DNRC's 3-year timber sale list as the next potential projects for Stillwater Unit. Currently, there is no initial proposal/proposed action, and the potential projects have not been scoped; therefore, DNRC has not initiated a preimpact study on these proposals.

OTHER AGENCIES WITH JURISDICTION/PERMIT REQUIREMENTS

The Montana Department of Fish, Wildlife and Parks (DFWP) has jurisdiction over the management of all fisheries and wildlife in the project area. DFWP is on the mailing list and has received the initial proposal and newsletter.

DNRC has had an ongoing contract with DFWP to collect data and monitor streams in Stillwater State Forest for existing fisheries habitat and the presence/absence of bull trout and westslope cutthroat trout.

PERMITS THAT MAY BE REQUIRED TO IMPLEMENT THE PROPOSED ACTIONS

- A Stream Preservation Act Permit (124) is required from DFWP for activities that influence any fisheries stream.

- A Short-term Exemption from Montana's Surface Water Quality Standards (3A Authorization), issued by the Montana Department of Environmental Quality, may be required if temporary activities will introduce sediment above natural levels into streams and DFWP feels the permit is necessary after reviewing the mitigation in the 124 Permit.

- DNRC is a member of the Montana Airshed Group, which regulates DNRC slash burning. DNRC receives an air-quality permit through participation in the Airshed Group.

PUBLIC CONCERNS

Through the scoping process, concerns were raised by the public and specialists of DNRC and other agencies about the feasibility of a timber sale project and its potential impacts on the environment. These concerns were considered by DNRC in the development of project alternatives (see Chapter II). A summary of the comments that were incorporated into the alternatives is presented below.

VEGETATION

Comments included the following:

- DNRC should perform a habitat analysis that identifies, maps, and protects stands with the major components of old-growth habitat, such as large old trees, live/dead standing trees, and large-diameter logs/woody debris.

- Old-growth stands are in need of some forest management to maintain forest health in the project area. While forest health may be improved through the removal of diseased and/or insect-infested trees, another individual argued that some root rot pockets should be left undisturbed to help contribute to biologically diverse forests.

- The proposed actions should emulate natural historic fire regimes to determine the harvest unit size and shape and silvicultural treatment in the project area. Fire was also recommended as a means of addressing whitebark pine recovery through broadcast burning and a "let burn" policy for lightning-ignited wildfires.

- Past logging practices have directly contributed to a high percentage of poorly growing, overstocked stands in need of selective logging that would retain the largest and healthiest trees. The statement was made that this type of selective thinning should be considered in lodgepole pine stands to minimize the risk of pine beetle activity.

Although effects to sensitive plants and noxious weeds were not concerns specifically raised through public scoping, they will be analyzed.

AESTHETICS

Concerns were expressed that the Chicken/Werner Timber Sale Project would have negative visual impacts and that measures should be taken to:

- screen roads from view,
- avoid or minimize clearcutting, and
- use shelterwood, seedtree, and group-selection harvesting to minimize the overall effect of cutting timber.

WILDLIFE

Sensitive Species

The concerns expressed about sensitive species were that:

- The proposed action would negatively affect sensitive species, such as boreal owls, pileated woodpeckers, lynx, and fishers. A request was made for an alternative that incorporates travel corridors, streamside fisher buffers, and habitat maintenance for sensitive species that may inhabit the Chicken/Werner Timber Sale Project area.

- Old-growth levels are below the amounts necessary to ensure viability of old-growth-associated species, such as pileated woodpeckers, northern goshawks, and pine martens. *(See additional old-growth concerns in the "Vegetation" section).*

Habitat

The following wildlife-habitat concerns were expressed:

- The landscape in this area is already fragmented and a network of valuable habitat areas would be severed, resulting in a decrease of future wildlife use and viability.

- Proposed harvest activities may increase fragmentation, decrease patch size, and reduce habitat connectivity in the project area.

- Fire suppression has reduced whitebark pine habitat and resulted in a net loss of forage production for numerous wildlife species. This concern was accompanied by a recommendation to prescribe fire or allow natural fires to burn in order to improve wildlife habitat, regenerate whitebark pine, and enhance forage production for grizzly bears and other browsing species.

One individual commented that habitat security linkage zones would be further improved through road obliteration in excessively roaded areas.

Snag and Down Woody Material Management

Concern was expressed that adequate amounts of large-diameter snags or potential snags to provide long-term habitat (required by cavity-nesting birds and other species) may not be left standing. In addition, down woody material of certain sizes and historic-level quantities may not be left in harvest units to provide habitat for various wildlife species.

Threatened and Endangered Species

Concern was expressed that new road construction in the project area may reduce habitat for large mammals, including, but not limited to, grizzly bears.

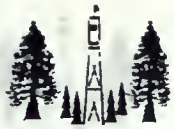
Grizzly Bears – A concern was raised that the proposed action may reduce hiding cover, seasonal habitat, and security core areas.

Bald Eagles – A concern was raised that the proposed activities could negatively impact perching, foraging, and potential nest sites in the Chicken/Werner area.

Northern Rocky Mountain Wolf – A concern was raised that effects from the proposed action could negatively impact rendezvous sites, active den sites, and prey base (big game populations) in the Werner Peak area.

Big Game Species

Big game concerns were not specifically raised through public scoping; however, big game will be analyzed as per DNRC guidance.



ROADS

The concerns pertaining to roads were that:

- Total road construction should be minimized, and existing roads must be improved to comply with BMPs.
- Safety guidelines for loggers and truckers need to be enforced in this popular recreational area; the roads are narrow and extreme caution should be used.
- The need for road expansion should be addressed on this project and options should be considered to close existing roads in order to avoid a "net increase in total road density".

ECONOMICS

Economic concerns expressed were that:

- Adequate information be presented to enable decisionmakers and the general public to consider both the short- and long-term economic effects of the proposed activities (or no action) on the individual beneficiary trusts. To address this concern, a recommendation was made to use a "return-on-investment calculation" to assure a reasonable return on investment for each beneficiary.
- DNRC follow the MEPA process and fully examine other viable economic options as part of the action alternatives.
- DNRC analyze the economic trade-off associated with the various logging systems and alternatives, so that beneficiaries would not be short-changed by timber bids that reflect costly and unnecessary logging systems.

WATERSHED

Watershed concerns expressed were that:

- The minimum Streamside Management Zone (SMZ) widths may not be adequate to protect water quality in some portions of the project area.
- Provided the SMZ law and rules and BMP standards are followed, DNRC should not rule out timber management within SMZs where appropriate.
- Timber-harvesting and road-construction activities in a water-quality-limited watershed may generate sediment above naturally occurring levels if not properly mitigated.
- Long-term timber management may lead to increases in water yield, which can lead to cumulative effects to the Lower Swift Creek watershed.

FISHERIES

Fisheries concerns expressed were that:

- The cumulative impacts of forest-management activities could adversely affect bull trout and westslope cutthroat trout populations in and around the proposed project area.
- The minimum SMZ widths may not be adequate to protect bull trout and westslope cutthroat trout habitat in some portions of the project area.

SOILS

Concern was expressed that the use of tractors or rubber-tired skidders to remove logs could lead to compaction and displacement of topsoil, which could lead to a decrease in soil productivity. The primary concern is to evaluate the logging systems used and minimize

the compaction and displacement of soil during management activities.

ARCHAEOLOGY

Concerns were raised that timber harvesting might cause irreparable harm to historical or archaeological resources. An individual recommended the EIS include a report for an archeological and cultural survey on the project area. *(A DNRC archaeologist examined the project area for historical or archaeological resources, but found none. Mitigation measures would be implemented if archaeological resources were found during further examination or during project activities. (Refer to Appendix A.)*

CHAPTER II

ALTERNATIVES

INTRODUCTION

The purpose of Chapter II is to introduce several action alternatives for the Chicken/Werner Timber Sale Project area and summarize the effects of implementing each of those alternatives. The first part of this chapter will focus on the development of the action alternatives and summarize the differences and similarities. The last part of Chapter II will briefly outline *(see TABLE II-2)* the probable environmental consequences associated with each alternative. This table summarizes effects of the detailed environmental analysis in Chapter IV.

DEVELOPMENT OF ALTERNATIVES

An ID Team was formed in May, 1997, to work on the Chicken/Werner Timber Sale Project. The role of an ID Team is to develop management options within a project area and analyze potential impacts on the human and natural environments. Alternative development for the Chicken/Werner Timber Sale Project began when DNRC initiated a proposed action and project timeline. A 30-day comment period followed and a set of project issues were developed *(see Chapter I, Public Scoping)*.

ID Team members and other DNRC personnel were involved in a thorough field reconnaissance of the Chicken/Werner Timber Sale Project area during 1997 and 1998. Data was collected for the project area resources and transportation systems to aid in the analyses of wildlife habitat, hydrology, timber harvesting, road standards, economics, and the development of mitigation. Additional information about the affected environment was collected to assist in designing mitigation and completing analysis work.

The ID Team discussed how to address issues, generate additional revenue for the school trust, and meet our State biodiversity guidance. DNRC's SFLMP contains a set of resource management standards that played an important role in the types of mitigation measures and management options developed during this phase of the project. These ideas were incorporated into several different management proposals for the project area.

DNRC was unable to implement several of the proposed alternatives due to constraints found in the SFLMP or

the inability to adequately mitigate for environmental consequences. The following action alternatives for this project were dismissed.

ALTERNATIVES CONSIDERED, BUT NOT GIVEN DETAILED STUDY

- One alternative option was to construct more roads for improved land-management access and to lower logging costs. The SFLMP requires DNRC foresters to minimize road construction and avoid unnecessary road building by using alternative harvest methods. The portion of the project area not currently accessed by roads includes steep slopes that would require relatively expensive road construction in order to minimize impacts. New roads on these steep areas would access timber at higher elevations. This timber would be of lower value and have less volume.

  The Chicken/Werner Timber Sale Project area is part of a "bear management unit" (BMU) and contains grizzly bear security core areas that must be maintained. In order to maintain these security core areas, no net increase in road density would be permitted. Additional road construction would require the closure of existing roads in order to avoid a net gain in road densities within the BMU. DNRC guidance allows management flexibility through the option of closing other road segments when a new one is opened. Roads that could be closed to mitigate for new open roads were limited to main thoroughfares. This was dismissed as an option due to the amount of public recreational use these roads receive. There are also roads located on the west side of the bear subunit that could be closed; however, doing so would not adequately reduce effects to bear habitat.

- The wood products industry is currently experiencing a decline in log prices and wood demand. One alternative that was under consideration was to defer stands that would require helicopter logging until the forest product markets improve. No one is able to predict the economic future of the forest products industry, so helicopter logging was not eliminated as an option for this project.

- Lower Whitefish and Werner Peak roads are extensively used by recreationalists that frequent Stillwater State Forest. The current DNRC recreational management focus lies in the generation of income through State Special Use Permits or Recreational Use Permits. At this time, these permits generate a nominal income for the State lands trust. In order to expand the potential for generating revenue, such as through permits for huckleberry picking, mushroom gathering, renting lookouts or cabins for overnight use, mountain biking, hiking, cross-country skiing, and firewood cutting, some form of law enforcement or monitoring would be required. This may be a future focus for recreational management on State forests; however, a significant increase in revenue generated through recreational activities would be required. Specific recreation proposals have not been presented as options to date. Future proposals would not preclude other management activities.

DESCRIPTION OF ALTERNATIVES

This section describes the No-Action Alternative, as well as the 4 action alternatives that were developed. Components and mitigation measures that are common to the action alternatives are described in this section. Stipulations and specifications designed to protect resources during harvesting and road-improvement activities are incorporated into the contract clauses and timber sale administration. These stipulations

and specifications are a form of mitigation; those that would be applied to an action alternative in this project are listed in Appendix B. Mitigations designed to reduce impacts on a particular resource is also discussed in Chapter IV.

NO-ACTION ALTERNATIVE

Under the No-Action Alternative, no proposed timber harvesting or road reconstruction would occur in the Chicken/Werner Timber Sale Project area at this time. Recreational use, firewood cutting, road maintenance, fire suppression, additional requests for easements, and other ongoing management activities may occur. Natural events, including plant succession, windthrow, and wildfires, will continue to occur. Future actions, including timber harvesting, would be proposed and go through the appropriate environmental analysis before implementation. Some seasonal or permanent road closures may be installed to protect water quality and investments in road maintenance.

The No-Action Alternative, which can be used as a baseline for comparing the environmental consequences of the 4 action alternatives, is considered a viable alternative for selection.

COMPONENTS COMMON TO ALL ACTION ALTERNATIVES - ALTERNATIVES B, C, D, AND E

(The decisionmaker may select a modification or combination of alternatives)

The ID Team developed the timber-harvesting alternatives based on an analysis of current and appropriate timber-stand conditions. Proposed treatments would move the timber-stand conditions toward the desired age-class and cover-type conditions historically present upon the landscape. Details on appropriate conditions are described in the DNRC Biodiversity Guidance.

Existing roads and temporary spur roads would be used to access harvest units. Only one temporary spur road, approximately 1,700 feet in length, is proposed for improved yarding access in the southeast corner of the project area. The spur would be reclaimed after harvesting activities are completed. A DNRC hydrologist and DNRC foresters conducted a survey of the existing roads in the gross sale area. The purpose of the survey was to identify surface drainage and erosion problems that could be improved to prevent sediment delivery to streams. In each of the action alternatives, sediment delivery reduction and the implementation of BMPs would be accomplished through a road-improvement package that would meet the following objectives:

- accommodate a moderate level of dispersed recreation on open roads,
- seasonally close some roads to mitigate for wildlife and water quality, as well as to protect investments in road maintenance, and
- improve ditch relief, surface drainage, safety, and maintenance on the Werner Peak and Lower Jellison roads. This would require replacing and installing culverts, drive-through drain dips, safety turnouts, and rubber flappers and removing trees in the "right-of-way" to improve visibility. Lower Whitefish Road was improved extensively in recent years and would only require minor ditch maintenance work and 2 new culverts.

The following concepts were developed to define alternatives and differentiate between them:

- Patch size, connectivity, old-growth-attribute levels, and location on the landscape were elements used to determine the relative value of old-growth stands

on Stillwater State Forest. This criteria was used, along with input from the NWLO wildlife biologist, to determine the value of functionally important old-growth stands in the project area. Through this analysis process, 2 stands and a portion of another stand were identified as having high old-growth-attribute levels relative to the rest of the project area. These stands are also located near a perennial stream and are adjacent to other continuous old-growth stands. These stands with higher wildlife habitat values were deferred for future management opportunities.

- Some stands within the Chicken/ Werner Timber Sale Project area are in need of management and cannot be readily accessed from the existing road systems. Because additional road construction is difficult and expensive, helicopter logging was presented as a viable economic option in some stands on the project area. Stands that require helicopter yarding would increase the average logging cost. In order to address economic concerns, harvesting in those stands would be presented as an option in some alternatives and eliminated in others.

In addition to the concepts listed above, the following criteria were used to develop all of the timber harvesting alternatives:

- The health and vigor of the stand would be improved by reducing stand density, salvaging trees attacked by insects and diseases, and establishing vigorous regeneration with a species mix that includes western larch, Douglas-fir, lodgepole pine, and western white pine in openings created through timber harvesting.

- Western larch and Douglas-fir cover types were determined to be the most underrepresented cover type on Stillwater State Forest. All action alternatives would promote the regeneration of species components that include western larch, rust-resistant western white pine, and Douglas-fir.

- The natural role of wildfire in this area would be reflected by manipulating the stand structure and species composition and varying the silvicultural prescriptions. This would minimize the potential risk of uncontrollable fire hazards and provide opportunities for site preparation using prescribed burns.

- DNRC's minimum old-growth definition is currently defined as stands where the average tree age is 150 years or more and that contain at least 4 thousand board feet (MBF) per acre. Over half of the project area met this criteria; many of those stands were composed of severely diseased grand fir, subalpine fir, lodgepole pine, or western white pine. In the 1950s, 75% of the Chicken/Werner Timber Sale Project area was logged, removing most of the merchantable western larch and Douglas-fir from those stands. In an attempt to regenerate these sites and increase the level of western larch/Douglas-fir-type stands on the forest, a decision was made to evaluate the level of old-growth attributes on a stand-by-stand basis. This became a primary concept in the development of Alternatives, rather than using the assigned age class to determine whether the area required management at this time.

ALTERNATIVES B AND C

Under the proposed actions of Alternatives B and C, harvesting would occur in 4 stands (Alternative B) or 2 stands (Alternative C) identified as having moderately high old-growth attributes. Harvest treatments under these alternatives would retain many of the old-growth attributes such as large live trees, snags, and large down woody debris. This would be accomplished through the removal of the shade-tolerant

species that are now dominating the intermediate canopy. The shade-tolerant species, targeted for removal in this harvest entry, would include subalpine fir, grand fir, and Engelmann spruce. Signs of disease and/or recent mortality are exhibited in a high percentage of the lodgepole pine and western white pine throughout the Chicken/Werner Project area. Some diseased trees would be salvaged during logging operations if one of these action alternative were chosen. Old-growth characteristics would be maintained by retaining forest and canopy structures within the stands.

The remainder of the project area consists of stands with few old-growth attributes and a heavy mixed-conifer component. Alternatives B and C would increase the proportions of western larch/Douglas-fir and western white pine cover types by thinning the mixed-conifer stands and regenerating the openings with larch, Douglas-fir, and western white pine.

Alternative B has harvest units that include helicopter yarding. Logging these units would be optional for the purchaser. The total proposed harvest volume for Alternative B is approximately 5.5 MMBF in 23 harvest units from 1,262 acres. In Alternative B, the portion of the timber sale designated as optional helicopter volume includes approximately 1.5 MMBF from 367 acres in 9 harvest units. *(See FIGURE II-1.)*

Alternative C contains the same units and harvest treatments as Alternative B, with the exception of the optional helicopter units. The 9 helicopter units would not be entered with Alternative C. This option was eliminated to address the issue of expensive yarding systems. The remaining volume available for harvesting is 4 MMBF in 15 units on 895 acres. *(See FIGURE II-2.)*

ALTERNATIVES D AND E

Alternatives D and E were developed with the management philosophy of deferring treatment in stands identified as having high proportions of old-growth attributes. With Alternatives D and E, Units 18, 19, 20, and 21 would not be harvested during this project entry. DNRC would have time to reevaluate future management needs for those stands.

The remainder of the project area would be managed under the same treatments as Alternatives B and C. Alternatives D and E would emphasize removal of encroaching midlevel and understory mixed-conifer trees in order to increase the proportions of western larch/Douglas-fir and western white pine cover types. Large trees, high-value snags, and concentrations of down woody material would be maintained in these stands where past logging activities have contributed to concentrations of overstocked shade-tolerant species.

Alternative D contains 7 harvest units that would require helicopter yarding; as with Alternative B, the Timber Sale Contract would specify that logging the helicopter units is optional. Alternative D would harvest approximately 3.7 MMBF from 917 acres in 19 harvest units. In alternative D, the portion of the timber sale designated as optional helicopter volume includes approximately 700 MBF from 225 acres in 7 harvest units. *(See FIGURE III-3.)*

Alternative E is the same as Alternative D, with no optional helicopter yarding units. Alternative E has 12 harvest units on 692 acres; the harvest volume is approximately 3 MMBF. *(See FIGURE III-4.)*

In each of the above action alternatives, harvest unit acres and volumes are likely to be slightly different.

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FIGURE II-1

Alternative "B" (With Optional Helicopter Ground)

Estimated Net Volume: 5,447 Mbf 1,262 Acres

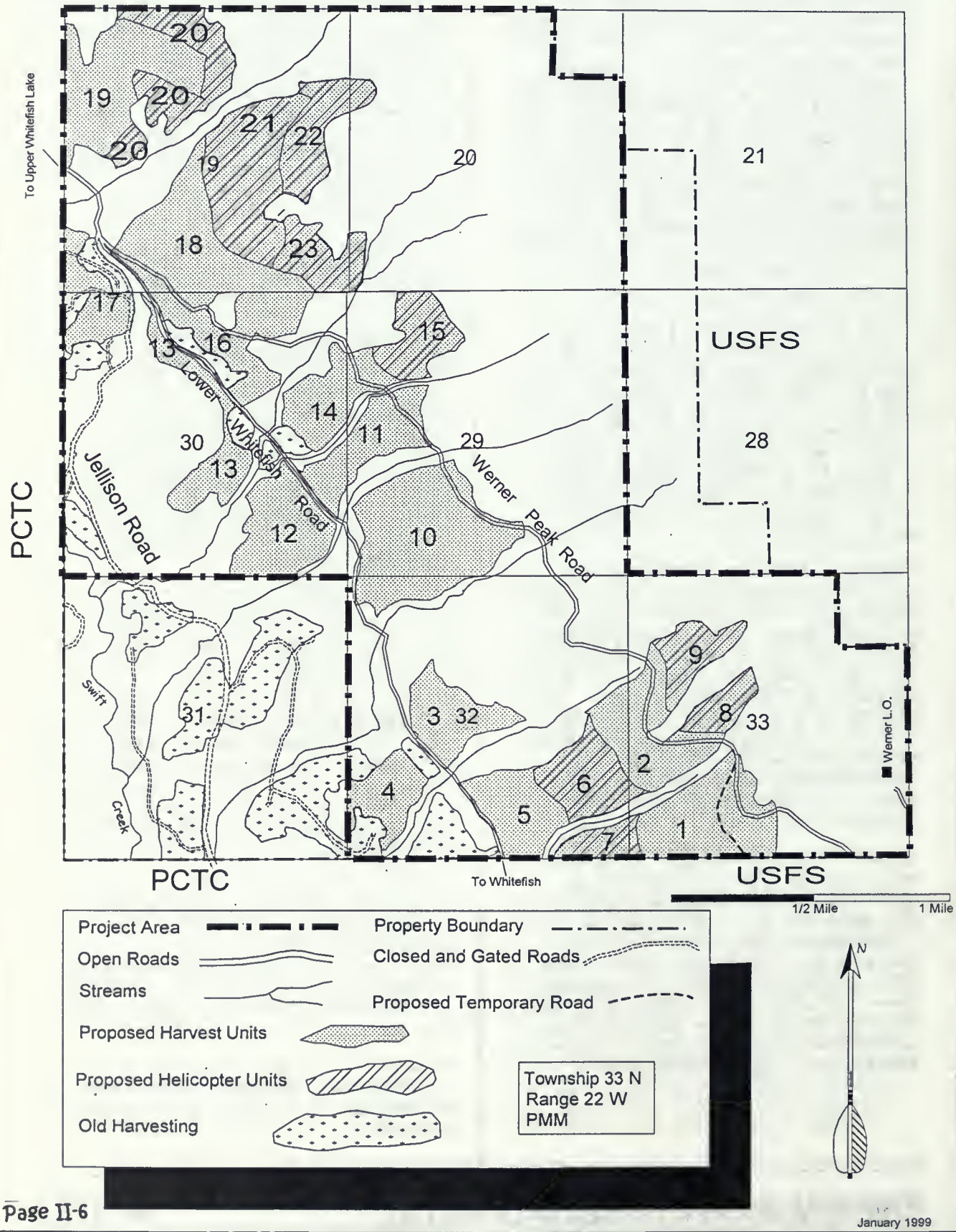

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FIGURE II-2

Alternative "C" (No Helicopter Units Proposed)

Estimated Net Volume: 4,015 MBF 895 Acres

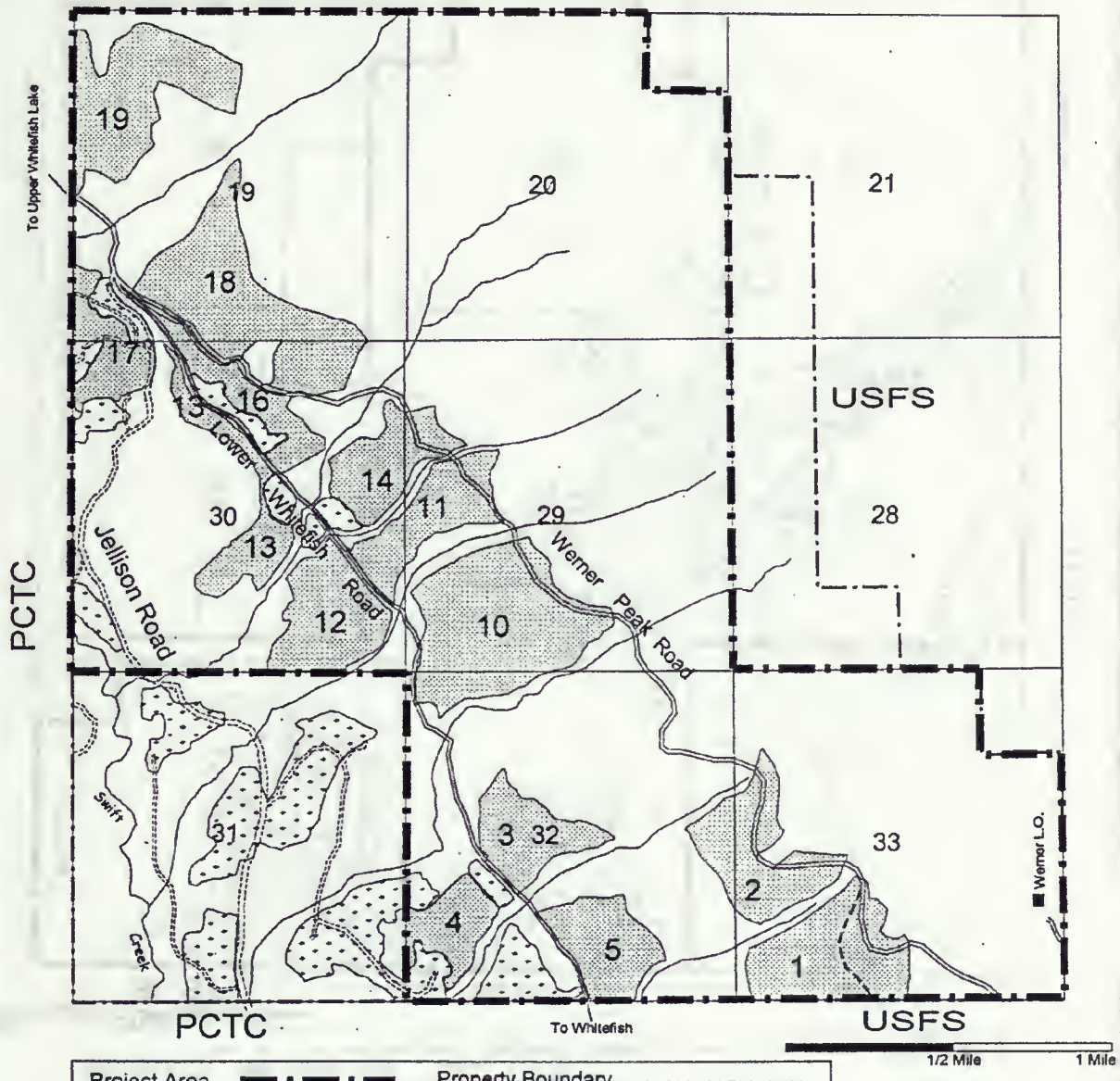

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FIGURE II-3

Alternative "D" (with Optional Helicopter Units)

Estimated Net Volume: 3,695 MBF 917 Acres

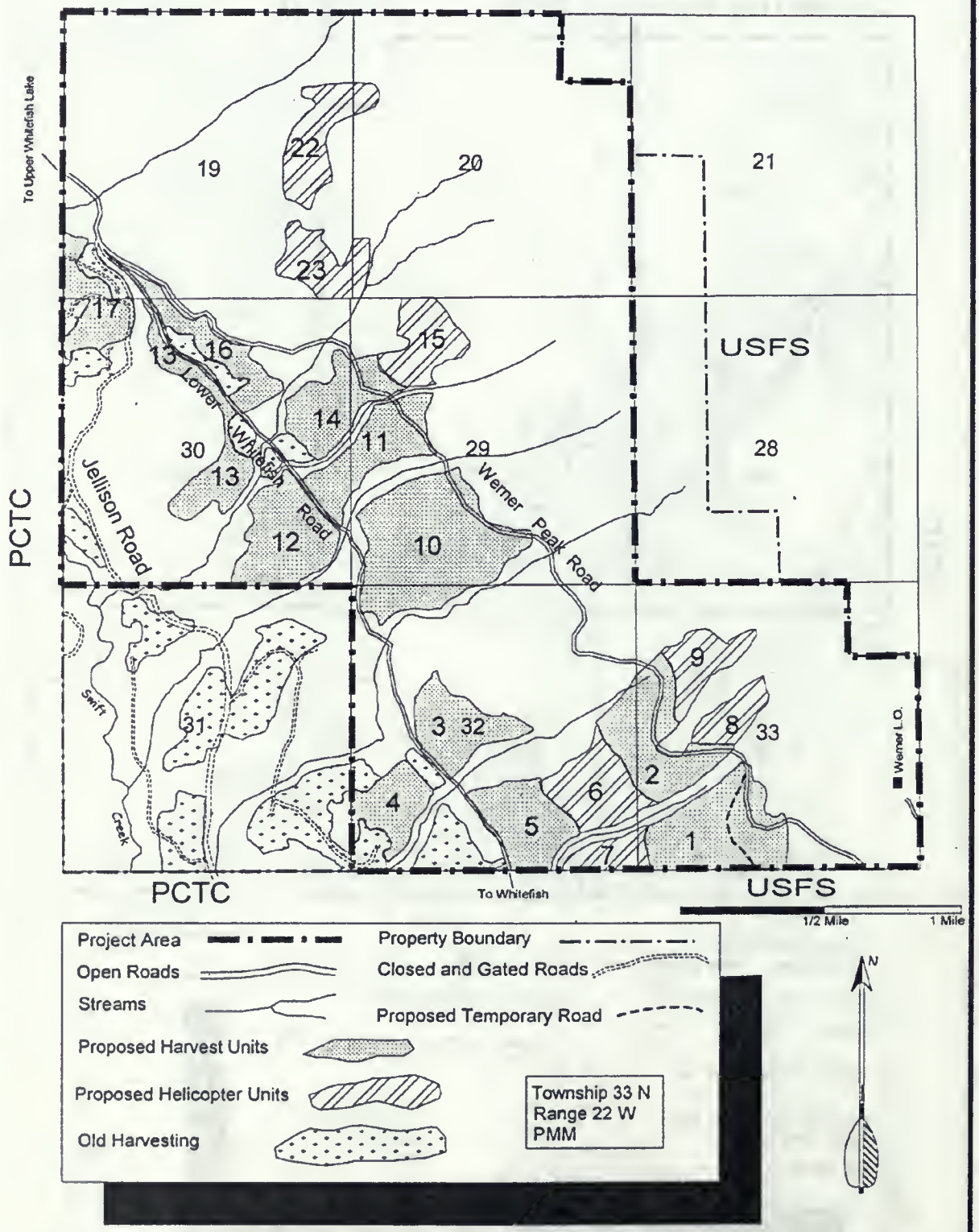

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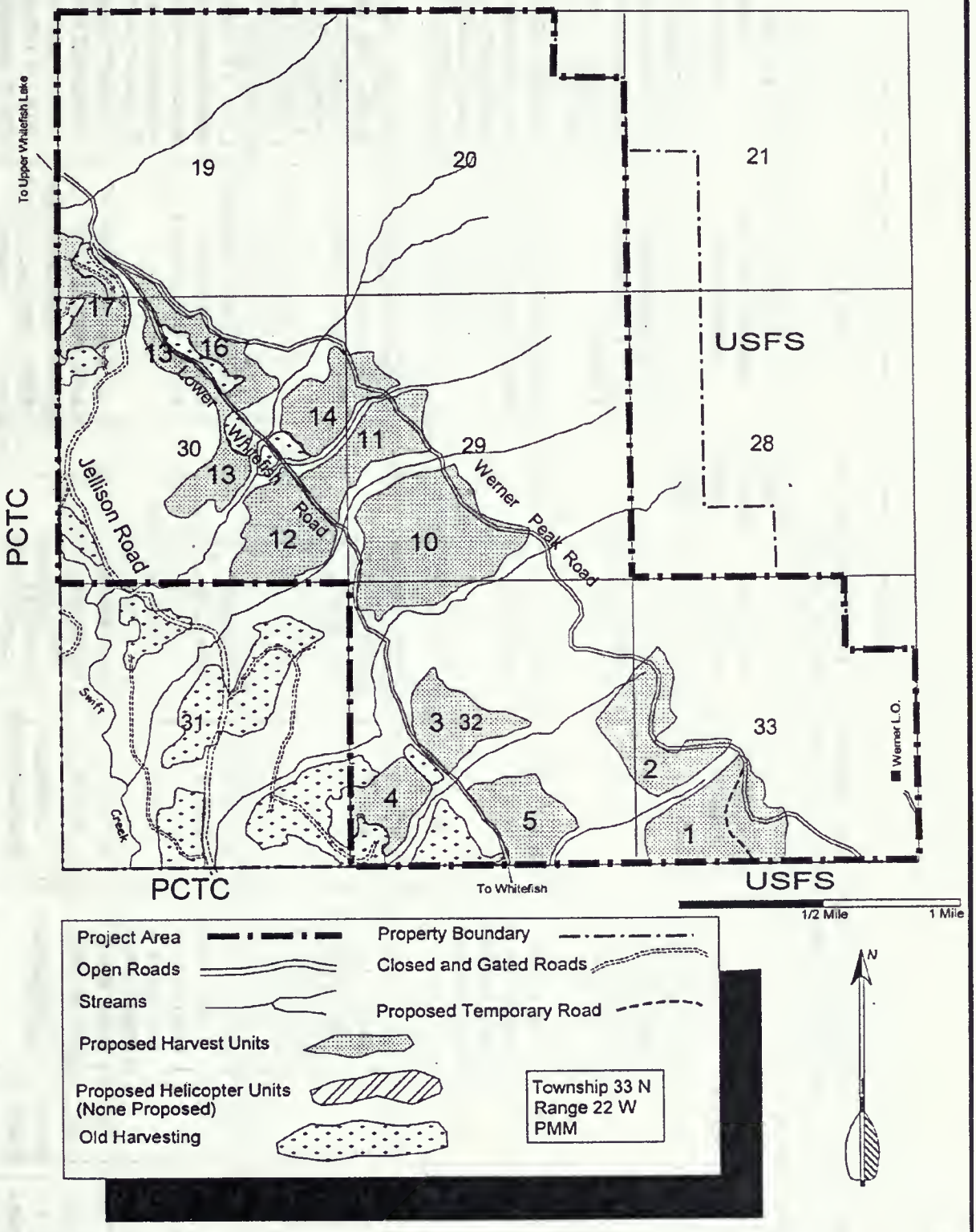
FIGURE II-4

Alternative "E" (No Helicopter Units Proposed)

Estimated Net Volume: 2,955 MBF 692 Acres



TOTAL ACRES AND NET HARVEST VOLUMES FOR ALTERNATIVES B, C, D, AND E. These acreage and harvest volume estimates are likely to vary as streamside management zones (SMZ), fisher buffers, and other adjustments are taken into consideration.

TABLE II-1 PROPOSED SILVICULTURAL TREATMENTS FOR ALTERNATIVES B, C, D, and E
(Helicopter yarding is optional in Alternatives B and D)

UNIT #	TOTAL ACRES	TREATMENT	ALTERNATIVES TREATED	YARDING METHOD	NET HARVEST VOLUME (MBF)	HAZARD REDUCTION/SITE PREPARATION	REGENERATION METHOD AND SPECIES
1	83	Modified seedtree/ shelterwood w/reserves	B, C, D, and E	Tractor and cable yarding	378	Broadcast/jackpot burn; machine pile on moderate slopes	Fully plant openings with western larch and western white pine; natural Douglas-fir regeneration
2	68	Modified seedtree/ shelterwood w/reserves	B, C, D, and E	Cable yarding	280	Broadcast/jackpot burn	Natural lodgepole pine and Douglas-fir regeneration; inter-plant western larch and western white pine
3	46	Modified seedtree/ shelterwood (thin from below)	B, C, D, and E	Tractor and soft-track yarding	176	Broadcast/jackpot burn; machine pile and scarify	Natural lodgepole pine, red cedar, and Douglas-fir regeneration; interplant western larch and western white pine
4	35	Group select and modified seedtree w/ reserves	B, C, D, and E	Tractor yarding	301	Broadcast/jackpot burn; machine pile and scarify	Lack of good seedtrees; plant western white pine, western larch, and Douglas-fir
5	53	Thin from below and group select	B, C, D, and E	Soft-track yarding and/or downhill cable yarding	196	Excavator pile and scarify; broadcast/jackpot burn	Natural lodgepole pine and Douglas-fir regeneration; interplant with western larch and western white pine

UNIT #	TOTAL ACRES	TREATMENT	ALTERNATIVES TREATED	YARDING METHOD	HARVEST VOLUME (MBF)	HAZARD REDUCTION/SITE PREPARATION	REGENERATION METHOD AND SPECIES
6	33	Thin from below and group select	B and D	Helicopter (possibly larger cable tower w/long line and intermediate supports)	182	Broadcast/ jackpot burn	Plant openings with western larch, and western white pine; natural Douglas-fir and lodgepole pine regeneration
7	18	Modified seedtree/ shelterwood w/reserves	B and D	Helicopter (possible for larger cable tower w/long line and intermediate supports)	101	Broadcast/ jackpot burn	Plant openings with western larch and western white pine; natural Douglas-fir and lodgepole pine regeneration
8	23	Modified seedtree w/ reserves	B and D	Helicopter	59	Broadcast/ jackpot burn; too steep for scarification	Natural Douglas-fir and lodgepole pine seed source available; elevation is too high for western larch
9	35	Modified seedtree/ shelterwood W/reserves	B and D	Helicopter	131	Broadcast/ jackpot burn	Natural Douglas-fir and lodgepole pine regeneration; interplant western larch and western white pine below elevation of 5,300 feet
10	129	Modified seedtree/ shelterwood w/reserves	B, C, D, and E	Tractor and soft-track yarding; limited cable skidding in southeast corner	401	Machine scarify and pile; broadcast/ jackpot burn	Interplant with western larch and western white pine; natural red cedar, Douglas-fir, Engelmann spruce, and lodgepole pine regeneration

UNIT #	TOTAL ACRES	TREATMENT	ALTERNATIVES TREATED	YARDING METHOD	HARVEST VOLUME (MBF)	HAZARD REDUCTION/SITE PREPARATION	REGENERATION METHOD AND SPECIES
11	52	Modified seedtree/ shelterwood w/reserves.	B, C, D, and E	Tractor yarding	293	Machine scarify, pile, and broadcast/jackpot burn	Natural lodgepole pine, Douglas-fir, and spruce regeneration; interplant western larch and western white pine
12	62	Modified seedtree/ shelterwood w/group selection	B, C, D, and E	Tractor yarding; soft-track yarding on wet ground	289	Wet site - machine pile and scarify where conditions allow; broadcast/jackpot burn	Lack of good seedtrees; plant western white pine, western larch, and Douglas-fir
13	34	Modified seedtree/ shelterwood w/group selection	B, C, D, and E	Tractor yarding; soft-track equipment on wet ground	136	Wet site - machine pile and scarify where conditions allow. Broadcast/jackpot burn	Lack of good seedtrees; plant western white pine, western larch, and Douglas-fir
14	56	Modified seedtree/ shelterwood w/reserves	B, C, D, and E	Tractor yarding	275	Machine scarify/ pile; broadcast/ jackpot burn	Natural Douglas-fir, western white pine, western larch, and lodgepole pine regeneration; interplant western white pine and western larch
15	30	Modified seedtree w/ reserves and group-select openings	B and D	Helicopter	136	Broadcast/jackpot burn	Natural western larch and lodgepole pine regeneration.; interplant western white pine and Douglas-fir in openings

UNIT #	TOTAL ACRES	TREATMENT	ALTERNATIVES TREATED	YARDING METHOD	HARVEST VOLUME (MBF)	HAZARD REDUCTION/SITE PREPARATION	REGENERATION METHOD AND SPECIES
16	40	Commercial thinning	B, C, D, and E	Combination tractor and cable yarding	153	Machine scarify/pile; broadcast/ jackpot burn	Use natural seed source if unit is scarified; if not, interplant with western larch and western white pine
17	34	Modified seedtree w/reserves	B, C, D, and E	Tractor or soft-track yarding	75	Wet site - machine pile/ scarify where conditions allow; broadcast- jackpot burn	Very good seedtrees for natural regeneration; interplant western white pine and some western larch
18	115	Thin from below	B and C	Tractor yarding or limited soft-track yarding on steeper slopes	649	Machine pile and scarify; broadcast/ jackpot burn	Natural regeneration in scarified openings; interplant unscarified areas with western larch and western white pine
19	88	Thin from below	B and C	Tractor yarding or limited soft-track yarding on steeper slopes	411	Machine pile and scarify; broadcast/ jackpot burn	Natural regeneration in scarified openings; interplant unscarified areas with western larch and western white pine
20-A 20-B 20-C	58	Thin from below	B	Helicopter yarding	325	Broadcast/ jackpot burn	Fully plant all openings with western white pine, lodgepole pine, Douglas-fir, and western larch
21	84	Thin from below	B	Helicopter yarding	464	Broadcast/ jackpot burn	Fully plant all openings with western white pine, lodgepole pine, Douglas-fir, and western larch

UNIT #	TOTAL ACRES	TREATMENT	ALTERNATIVES TREATED	YARDING METHOD	HARVEST VOLUME (MBF)	HAZARD REDUCTION/SITE PREPARATION	REGENERATION METHOD AND SPECIES
22	50	Modified seedtree w/ reserves	B and D	Helicopter yarding	83	Broadcast/ jackpot burn	Fully plant western white pine, lodgepole pine, and Douglas-fir in openings; plant western larch below 5;300 foot elevation
23	36	Modified seed tree w/ reserves	B and D	Helicopter yarding	50	Broadcast/ jackpot burn	Interplant western white pine, lodgepole pine, Douglas-fir, and western larch in openings

PROPOSED SILVICULTURAL TREATMENTS

Each of the 4 action alternatives would require a combination of 5 different harvest treatments (silvicultural prescriptions) to meet the described management objectives.

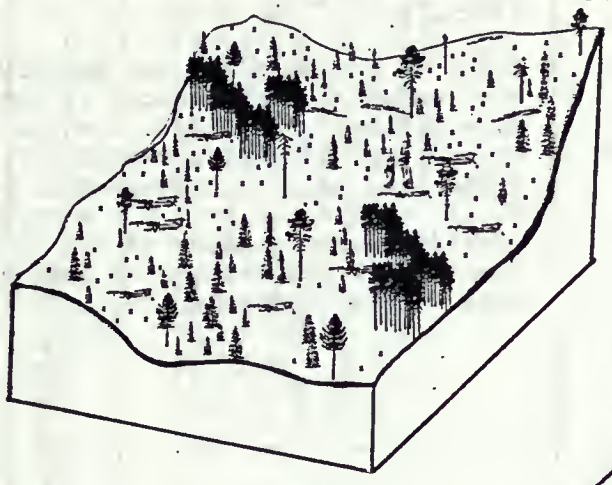
These silvicultural treatments are designed to reflect the historical effects of natural mixed-severity fires along the Whitefish Range. Where the existing stand would allow it, natural levels of the multistoried forest structure would be retained to perpetuate species diversity. The *Graphical Reproduction of Silvicultural Treatments (see FIGURE III-5)* provides a visual representation of how these treated areas may appear following harvesting. The visualizations are only a qualitative approximation of what would be expected to occur on the ground due to the variations in stand age, species components, and natural openings.

- *Modified Seedtree with Reserves* - Large western larch, Douglas-fir, and western white pine would be retained (approximately 5-8 trees per acre), individually and in clumps, to provide a seed source, future snags, and cavity-nesting sites. Existing snags and small clumps of younger trees would also be retained to provide for both structural and species diversity.

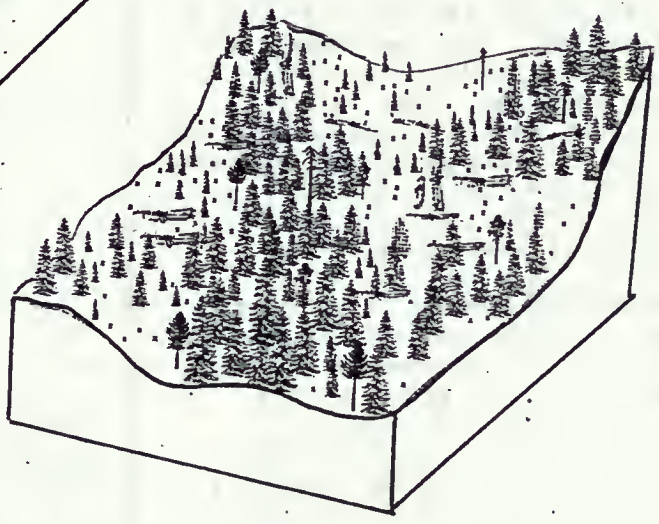
- *Modified Seedtree/Shelterwood with Reserves* - To provide a seed source, future snags, and cavity-nesting sites, approximately 5-8 large western larch, Douglas-fir, and western white pine seedtrees would be retained, individually and in clumps, per acre and approximately 40 trees per acre would be retained in shelterwood areas. Existing snags and small clumps of younger trees would also be retained to provide for both structural and species diversity.

- *Commercial Thinning* - Forty to sixty percent of the existing overstory would be harvested to reduce the stocking density, improve growth rates and vigor, and increase the seral

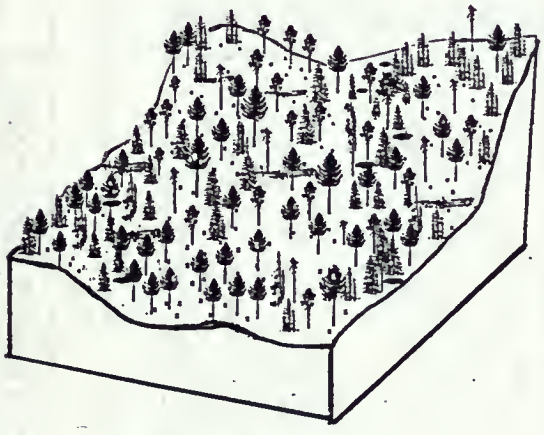
FIGURE II-5



Modified Seedtree with Reserves



Modified Seedtree/Shelterwood with Reserves



Commercial Thin Or Thin From Below

Group Select/Improvement Harvest Treatment

composition in the stand. Residual trees would include species that have a high resistance to fire and wind, such as western larch and Douglas-fir.

- *Group Selection* - Small openings, up to 5 acres in size, would be created in the existing stand to promote regeneration and/or release established regeneration. Snags and large seral trees that have a high potential to become future cavity-nesting sites would be retained. Good seedtrees would also be retained within group-select openings. The "group selection" method would be used in conjunction with modified-seedtree and shelterwood harvests to provide sufficient openings for shade-intolerant species.

- *Thinning from Below* - Harvesting focuses on the removal of trees in the lower and intermediate crown classes to favor those in the upper crown classes. The objective is to reduce stocking densities of subalpine/grand fir in the intermediate canopy layer and increase the seral component (Douglas-fir, western larch, and western white pine) in the species mix. Trees that are at high risk of value loss and mortality or those showing signs of low vigor (mistletoe-infested larch, blister-rust-infested white pine, or beetle-killed lodgepole pine) may also be removed. This method would be used to imitate the effects of low- and moderate-intensity fires that burn in periods between the less-frequent, high-intensity fires. Fire-resistant trees, such as western larch, Douglas-fir, western white pine, western red cedar, and the occasional ponderosa pine, would be retained. This harvest regime would promote old-growth attributes and remove approximately 30% of the canopy through the harvest of subalpine fir, grand fir, and salvaged insect- and disease-infested trees.

SUMMARY OF ENVIRONMENTAL EFFECTS

Table II-2 summarizes the primary environmental consequences of the alternatives. The basis for the conclusions of environmental effects summarized here is discussed in more detail in Chapter IV. For a more complete understanding of the terms, quantities, and statements presented here, refer to Chapter IV.

TABLE II -2 - ENVIRONMENTAL EFFECTS

RESOURCE	NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE			
	A	B	C	D	E
VEGETATION					
Cover-Type Representation on Stillwater State Forest *Note: See Chapter III for a complete table of current and appropriate cover types for the whole forest.*	No short-term change is anticipated. There would be a gradual increase of the mixed-conifer cover type and a decrease in the western larch/Douglas-fir cover type over time. Stillwater State Forest is currently low on the amount of western larch/Douglas-fir cover type by 19,198 acres and high on the amount of mixed conifer (13,626 acres) and subalpine fir (5,642 acres) cover types.	Approximately 760 acres of subalpine fir, mixed conifer, and lodgepole pine would be converted to a western larch/ Douglas-fir cover type; 87 acres would also move from mixed conifer to western white pine.	Approximately 475 acres of subalpine fir, mixed conifer, and lodgepole pine would be converted to a western larch/ Douglas-fir cover type.	Approximately 489 acres of subalpine fir, mixed conifer, and lodgepole pine would be converted to a western larch/ Douglas-fir cover type.	Approximately 225 acres of subalpine fir, mixed conifer, and lodgepole pine would be converted to a western larch/ Douglas-fir cover type.
Age-Class Distribution on Stillwater State Forest *Note: See Chapter III for a complete table of current and appropriate age classes for the whole forest.*	No short-term change is expected. There would be a gradual decrease of 0-to-39-year-old stands over time. Current/appropriate age-class condition for Stillwater State Forest: 0-39 years - 8,189 acres 40-99 years - 24,569 acres 100-149 years - 24,087 acres Old 150+ years - 34,301 acres	Number of acres that would change to a seedling/sapling age class of 0-39 years old following the proposed harvesting alternatives:			
		330	273	285	273
		No increase/decrease in the pole-sized class of 40-99 years old following the proposed harvest.			
		Reduction in the number of acres of the 100-to-149-year age class following each proposed harvest alternative:			
		367	362	322	362
		Changes to the number of old-growth acres are in the following old-growth representation.			

RESOURCE	NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE			
	A	B	C	D	E
Old-growth representation on Stillwater State Forest: DNRC's commitment (acres) to 1/2 historic: (minimum retention) PP - 11 DF - 31 WL/DF - 9,452 WWP - 817 LPP - 299 MC - 1,831 SAF - 2,268 *Total - 14,717*	The existing amount of Chicken/Werner Project area old growth (1,939 Ac.) would not change in the short-term. Current old-growth acres on Stillwater State Forest: Ponderosa pine - 31 Douglas-fir - 250 Larch/Douglas-fir - 8,731 Western white pine - 6,367 Lodgepole pine - 253 Mixed conifer - 8,279 Subalpine fir - 10,338 *Total- 34,249*	Old-growth stands would be entered in some cases and attributes would be changed in the short-term. The amount of old-growth would be reduced by the following number of acres:			
		367: WWP - 63 SAF - 48 MC - 216 Other - 40	362: WWP - 63 SAF - 42 MC - 172 Other - 85	322: WWP - 63 SAF - 42 MC - 171 Other - 46	362: WWP - 63 SAF - 42 MC - 172 Other - 85
Cumulative Patch characteristics (size and shape)	Current cover-type patch size: 122 mean (19 median) Current age-class patch size: 106 mean (18 median)	Change in cover type patch size: 3-acre mean decrease (.2 acre median) Change in age class patch size: 3.2-acre mean decrease (1 acre median)			
Old-Growth Attributes					
Large live trees	No substantial change as the largest trees would be retained	No substantial change in seral species as the largest and oldest trees would be retained with the proposed harvest treatments. Large shade-tolerant trees would be appreciably reduced in order to manipulate cover-type acres.			
Coarse woody debris	In the absence of a large natural disturbance, only a gradual increase of coarse woody debris over time.	Coarse woody material would increase appreciably due to the residual coarse woody material committed for retention in the proposed harvest treatments.			
Snags	The number of snags would gradually increase over time with tree mortality.	A slight decrease in the number of snags and snag recruits as a result of the harvest treatments. Most snags would be left and live snag-candidate trees would be retained wherever possible.			
Tree vigor (decadence)	Over time, tree mortality would increase and stand vigor would decrease.	Following harvest treatments, tree vigor would increase and decadence would be reduced in the short-term.			

RESOURCE	NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE			
	A	B	C	D	E
Sensitive Plants and Noxious Weeds					
Sensitive plants	No expected change in the existing populations of moonwart	Due to the location of the existing sensitive plant populations, no change is anticipated.			
Noxious weeds	Populations may continue to increase with increases in recreational use. Continued monitoring and spot herbicide applications would reduce the current rate of spread for oxeye daisy, knapweed, and St. John's wort.	Initially, populations may increase with the exposure of mineral soil on disturbed ground and road-improvement projects. Ongoing monitoring and herbicide applications would help reduce the spread of noxious weed populations over the long-term.			
AESTHETICS					
Scenic viewpoints and foreground viewing	Assuming no large-scale natural disturbances occur, minor changes to area visuals are expected.	Effects of the proposed harvesting would be visible from open roads. Road screening, reserved trees, and the harvesting methods are expected to reduce the overall visual effect of thinning units on this steep hillside. Visual effects would include changes in texture, variations in color, and increases in view distances.			
AIR QUALITY					
Fuel hazard reduction "smoke"	No change in existing levels.	Increased smoke from slash-burning operations would have short-term negative effects on air quality, but would not exceed the maximum allowable levels as defined by the State of Montana Cooperative Smoke Management Plan.			
Road dust	No change in existing levels.	Road dust is expected to increase from harvesting activities that take place during the summer and fall seasons.			
WILDFIRE HAZARDS AND RISKS					
Wildfire fuels	No change in short-term hazards or risks.	An increase in fire fuels is expected immediately following harvesting activities; however, long-term risks would be reduced.			
ROADS					
Safety	No short-term change.	Travel safety on Werner Peak Road would increase with improvements to sight distances on curves and an increase in the number of turnouts/ turnarounds.			

RESOURCE		NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE			
		A	B	C	D	E
Costs		There would not be any immediate cost; however, the road value would depreciate over time and maintenance and emergency repairs would increase as the existing road standard decreases.	An estimated sale-development cost of $169,996 for all action alternatives would be invested in road improvements to existing drainage features and a reduction of road source sedimentation to meet BMPs.			
Road uses		Future seasonal closures may be enforced to protect the road during snowmelt periods.				
		Existing road use would likely continue to increase due to the expanding number of people living and recreating in the Flathead Valley.	Road use would likely increase due to the road improvement projects proposed in the Action Alternatives, B, C, D, and E. The increasing numbers of recreationalists would also continue to expand at the current rate.			
Locations and standards of roads		There would be no change in road standards.	5.2 miles of Werner Peak Road would be upgraded to a secondary standard. One temporary road (1,700 feet long) is proposed for improved logging access.			
WILDLIFE						
Coarse filter for the habitat of all species		Forest conditions would continue to approach the climax phase, resulting in increased habitat for species that require shade-tolerant tree species and closed canopy for all or part of their habitat. The decrease in habitat is expected for those species that require seral forests for all or part of their habitat.	The action alternatives are similar in their effect on wildlife species. Wildlife species that require open canopies, large amounts of understory, and/or shade-intolerant tree species as all or part of their habitat would benefit from the proposed action alternatives. Species for whom alpine fir and grand fir habitats play an important function would be negatively affected approximately proportional to the reduction in acreage realized under each alternative.			
Threatened and Endangered Species						
Grizzly bear	Direct impacts	No change in direct disturbance or the existing security core area of 92%. (The 92% represents the portion of the total project area [3,452 acres] in the security core area.)	Helicopter and ground-based equipment disturbance - temporary loss of 39 acres of security core (0.1%)	Ground-based equipment disturbance - temporary loss of 39 acres of security core (0.1%)	Helicopter and ground-based equipment disturbance - temporary loss of 39 acres of security core (0.1%)	Ground-based equipment disturbance - temporary loss of 39 acres of security core (0.1%)

RESOURCE		NO-ACTON ALTERNATIVE	ACTION ALTERNATIVE			
	Habitat	A	B	C	D	E
		Percent of State trust lands retained in hiding cover (Lazy Creek Bear Management Subunit):				
		92% (same as existing)	84%	86%	86%	88%
		Existing and highest expected amount of acres of hiding cover within the Chicken/Werner Project area:				
		3,527	2,266	2,638	2,611	2,841
		Percent of Total Lazy Creek Bear Management Subunit (all ownership) retained in hiding cover:				
		62 to 81%	55 to 64%	56 to 65%	56 to 65%	57.to 66%
		POR = Percent of open-road density (% of Lazy Creek Bear Management Subunit with greater than 1 mile of road per square mile of land):				
		46.5%	46.6%	46.6%	46.6%	46.6%
		PTR = Percent of total-road density (% of Lazy Creek Bear Management Subunit with greater than 2 miles of road per square mile of land):				
		72.2%	72.6%	72.6%	72.6%	72.6%
Northern Rocky Mountain Wolf	Direct impacts	No direct impacts	Possible disturbance to wolves in the area during harvesting activities.			
	Habitat	Decrease in big game forage through time.	Increase of big game forage in units entered. Possible shifts in big game use of the area, resulting in increased prey for wolves.			
		1.2 miles per square mile of road density in the project area.	1.3 miles per square mile of road density in the project area due to the addition of a temporary road for harvesting.			
Sensitive Species						
Boreal owl	Direct impacts	No additional impacts	Negligible disturbance to owls as they appear to tolerate disturbance without much impact.			
	Habitat	Increase in habitat over time.	Loss of 57 acres of habitat.	Loss of 22 acres of habitat.	Loss of 57 acres of habitat.	Loss of 22 acres of habitat.
Fisher	Direct impacts	No additional impacts	Negligible disturbance due to location of harvests.			
	Habitat	Increase in habitat through time.	Loss of some resting and denning habitat. Retention of all habitat within 165' of perennial streams. Increase in stand diversity, which may increase foraging habitats. Travel routes retained.			

RESOURCE		NO-ACTION ALTERNATIVE	ACTION ALTERNATIVE			
		A	B	C	D	E
Lynx	Direct Impacts	No additional impacts	Possible disturbance to denning if helicopter Units 9, 15, and 22 are harvested (Alternatives B and D only.			
	Habitat	Increased denning and decreased foraging habitat through time.	Loss of 105 acres of denning habitat and a possible increase of 353 acres of future foraging habitat.	No modification of denning habitat. A possible increase of 151 acres of future foraging habitat.	Loss of 105 acres of denning habitat and a possible increase of 353 acres of future foraging habitat.	No modification of denning habitat. A possible increase of 151 acres of future foraging habitat.
Pileated woodpecker	Direct Impacts	No additional impacts.	Possible disturbance to birds using stands that would be harvested.			
	Habitat	Habitat quality expected to increase through time, then decrease as shade-intolerant trees die out of the stand.	Nesting structure would be retained in Units 13, 14, and 17; however, quality would decrease with canopy removal. Maintaining existing structure and creating openings for regeneration of shade-intolerant species is expected to perpetuate habitat quality into the future.			
			The quality of 146 acres of nesting habitat may be reduced by removing midstory cover.	No additional habitat would be modified.	The quality of 88 acres of nesting habitat may be reduced by removing midstory cover.	Additional habitat would not be modified.
Townsend's Big-eared Bat	Direct Impacts	No additional impacts.	Disturbance from harvesting activities may cause abandonment of roost sites in the area. However, no surveys or documentation of bats in the area exist.			
	Habitat	Habitat would decline through time as hardwoods die out and are not replaced.	Roosting structure (hardwoods) would be retained in harvest units.			
Big Game Species						
Direct Impacts:		No direct impacts expected.	Some direct impacts expected during harvesting activities.			

RESOURCE		NO-ACTON ALTERNATIVE	ACTION ALTERNATIVE			
		A	B	C	D	E
Habitat:	Hiding Cover:	Approximately 3,527 acres exist in the project area; this will probably increase in the future.	Hiding cover may be reduced to 2,266 acres, but would probably be higher due to residual trees.	Hiding cover may be reduced to 2,638 acres, but would probably be higher due to residual trees.	Hiding cover may be reduced to 2,611 acres, but would probably be higher due to residual trees.	Hiding cover may be reduced to 2,841 acres, but would probably be higher due to residual trees.
	Thermal Cover:	Currently, there are approximately 2,498 acres of thermal cover in the project area; this will probably increase in the future.	Thermal cover may be reduced to 1,348 acres, but would probably be higher due to residual trees.	Thermal cover may be reduced to 1,680 acres, but would probably be higher due to residual trees.	Thermal cover may be reduced to 1,609 acres, but would probably be higher due to residual trees.	Thermal cover may be reduced to 1,883 acres, but would probably be higher due to residual trees
ECONOMICS						
Forest improvement		N/A	$252,795	$186,382	$171,485	$137,188
Development Cost (Road improvement package)		N/A	$169,996	$169,996	$169,996	$169,996
Stumpage plus forest improvement and development		N/A	$595,956	$688,383	$459,695	$506,688
Total timber dollars returned to the trust.		N/A	$174,304	$333,328	$118,240	$198,052
Annual lease $		$1,000	$1,000	$1,000	$1,000	$1,000

RESOURCE	NO_ACTION ALTERNATIVE	ACTION ALTERNATIVE			
	A	C	D	E	
Jobs and income	This alternative would provide no timber-harvesting-related jobs or income for the regional forest products industry.	Potentially, 10.58 jobs are provided per MMBF harvested, with an average annual income of $31,866 per job (based upon regional estimates for northwest Montana).			
General recreation	No short-term change.	Potential increase in use due to improved conditions on Werner Peak Road. Potential increase in huckleberry gatherers.			
WATER QUALITY					
LOWER SWIFT SUBUNIT:					
Result of increase in ECA (allowable ECA is 3,440)	Existing 2,274	2,881	2,715	2,816	2,675
Water yield increases above natural levels (8% threshold)	4%	5%			
SWIFT CREEK HYDROLOGIC UNIT:					
Water yield increases above natural levels (8% threshold)	6%				
FISHERIES					
Westslope cutthroat trout	No measurable change expected.				
Bull trout					
SOILS					
Maximum acres of soil impacted	0	114	114	97	97
Percent of surface impacted in harvest units	0	9	13	11	14

CHAPTER III

EXISTING ENVIRONMENT

ENVIRONMENTAL CHARACTERISTICS, ANALYSIS AREAS, AND ANALYSIS METHODS

INTRODUCTION TO CHAPTER III

This chapter contains information about the environment of Stillwater State Forest and the Chicken/Werner Project area as it relates to the issues associated with this proposed project. Each resource analysis requires examination from a different geographic scale. Current conditions discussed in this chapter include the cumulative effects from past timber harvesting, fire suppression, known natural disturbances, and other management activities.

VEGETATION INTRODUCTION

The vegetation section will provide a detailed description of the present condition for the following vegetation-related resource-management issues.

- Past management activity
- Cover types, age-class distribution, and patch characteristics through a landscape-level analysis
- Old-growth commitments that focus on the amounts and attributes of old-growth stands
- Sensitive plants
- Noxious weeds
- Aesthetics/visual impacts
- Forest fire history and its role in natural stand conditions

In order to understand how each of the above issues was addressed, it is important to understand the geographical analysis area and methods of analysis. These are described in the following section of Landscape Analysis.

LANDSCAPE ANALYSIS

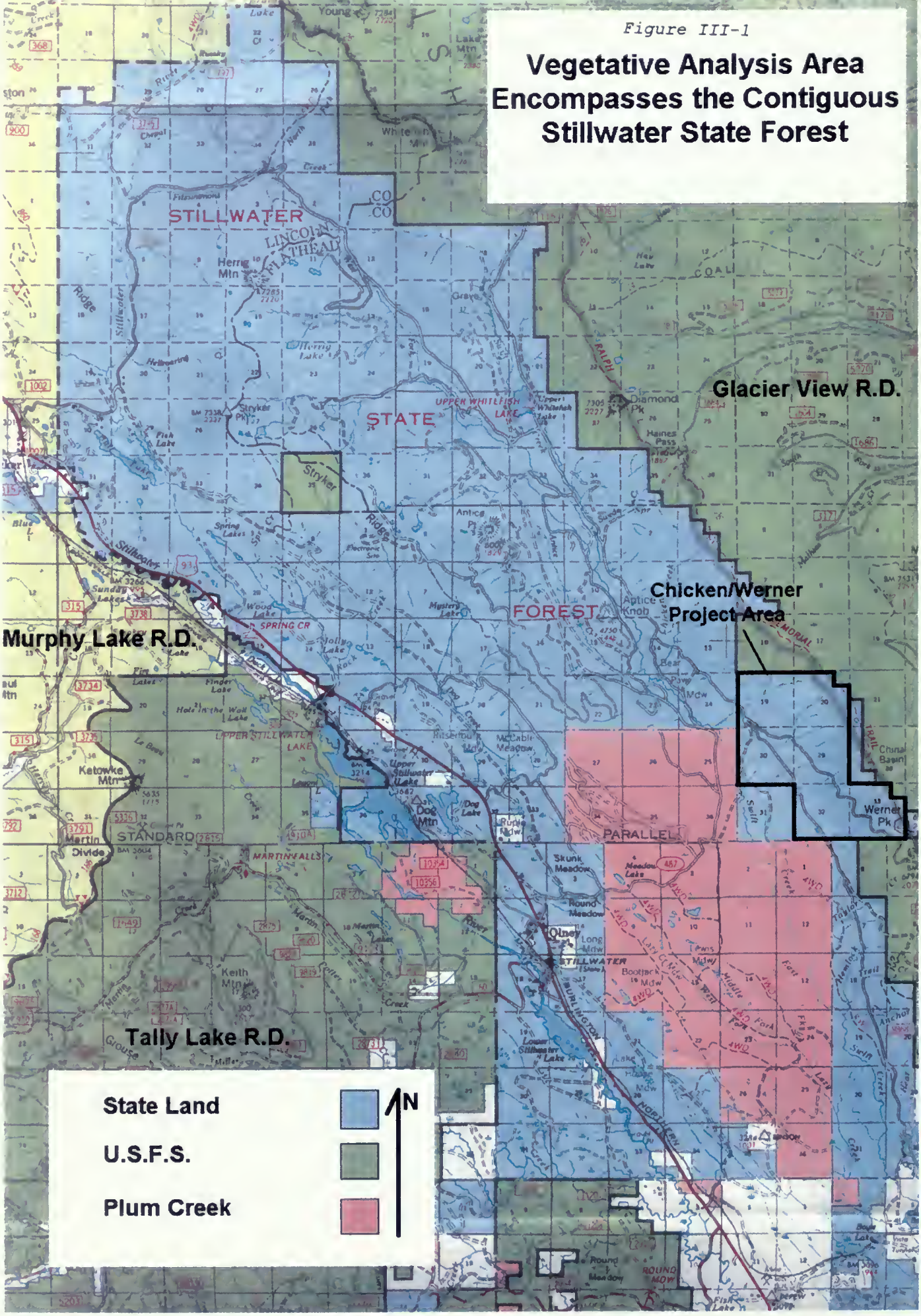
Background and Analysis Methods and Areas

- *Background*

The SFLMP directs DNRC to take a coarse-filter approach to biodiversity by favoring an appropriate mix of stand structures and compositions on State land (Montana DNRC 1996). To implement a coarse-filter approach and meet SFLMP directives, landscape analysis techniques were used to determine an appropriate mix of stand structures and compositions, including cover-type

Figure III-1

Vegetative Analysis Area Encompasses the Contiguous Stillwater State Forest



representation, age-class distribution, structural characteristics, and spatial considerations, such as patch size, shape, and location.

- *Analysis Methods*

This landscape analysis will view components such as cover-type representation from varying spatial scales. The analysis will also compare historic conditions with the current conditions and desired future conditions that are believed to be appropriate for the site occupied by stands in the project area. Inventory data from the 1930s was used in Losensky's 1993 data to estimate the proportion of various stand-structural stages by cover type as they were historically represented throughout the Inland Northwest. This provides an estimate of the natural characteristics of forests prior to fire suppression and extensive logging. Losensky (1997) has worked with DNRC to complete an analysis for the entire State; some vegetation types that are specific to that work are included in this analysis.

In reference to historic conditions and species mixes, the following methodology was used to analyze current stand conditions:

> *Two filters were developed and applied to Stillwater State Forest's current Stand Level Inventory (SLI) data. The filters were assigned cover types similar to those used in the inventory of the 1930s. The first filter followed the 1930s' criteria exactly, or as closely as possible, representing current conditions. The other filter (appropriate filter) assigns cover types using criteria primarily designed to help address the situation where succession from one cover type to another was occurring. The successional filter was developed to indicate that those areas in the absence of fire suppression, introduced pathogens, and timber harvesting would likely have been assigned to a different cover type than the current cover-type filter would suggest. The appropriate filter then estimates, from the current condition of the stand, what the stand would have looked like in 1900.*

The protocol used to assign cover types is explained in detail in the Coal Creek EIS, 1998 (the Coal Creek EIS is available for review at the Stillwater State Forest office at Olney).

Patch size will be expressed in acres and patch shape will be derived from the Patch Shape Index of Mcgarigal and Marks (1994).

- *Analysis Area For Vegetation*

Historic conditions will be displayed from the scale of Climatic Section 333c, which represents the Upper Flathead Valley. Current and appropriate conditions will be displayed on the scale of the contiguous Stillwater State Forest, approximately 93,807 acres, of which 91,147 acres are forested. Nonforest acres in lakes, ponds, wetlands, grazing land, and natural meadows were subtracted from the Stillwater land base where percentages of forested acres have been calculated. The cumulative effects analysis area for vegetation is limited to the boundaries of the contiguous Stillwater State Forest *(see Figure III-1)*.

SLI data is not currently available for scattered State sections; those sections are not included in the contiguous Stillwater database. SLI data is continuously updated to include changes where recent harvesting activities have taken place. This update process provides DNRC foresters with the

best available data for the required analysis on proposed management activities. Where current and future timber sales have not yet received a postharvest inventory, probable effects are taken into consideration to address cumulative impacts in each analysis area.

PROJECT AREA

The Chicken/Werner Project area, comprised of 3,752 acres in 6 sections, is located in the Lower Swift Creek watershed. The topography is characterized by gently sloped ground on the western side of the project area and steep mountainous terrain across the eastern half. These slopes are heavily timbered and elevations range between 3,650 and 6,960 feet. The portion of the project area above 6,000 feet in elevation consists mostly of avalanche chutes and subalpine fir cover types. The avalanche chutes lie at the head of 7 perennial streams that flow through the project area and into Swift Creek. The main Swift Creek drainage flows south of the project area and into Whitefish Lake.

Flathead National Forest (FNF) borders much of the project area to the north, east, and southeast, while one south section line and one west section-line boundary are shared with Plum Creek Timber Company (PCTC).

CURRENT CONDITIONS

Forest productivity in the Chicken/ Werner Timber Sale Project area is rated low to high, with the least productive sites in the higher elevations. The highest elevation sites have shallow soils and consist of subalpine fir, whitebark pine, and Engelmann spruce stands. The midslope portion of the project area, between 4,400 and 5,400 feet in elevation, has higher forest productivity levels and deeper soils. The timber stands in this area contain subalpine fir, Douglas-fir, lodgepole pine, western larch, western white pine, and Engelmann spruce. The most productive sites are located on moderate slopes below 4,400 feet and near draws where soils are deeper. These sites are predominately occupied with grand fir, Douglas-fir, western larch, western white pine, subalpine fir, Engelmann spruce, and lodgepole pine, with a scattered representation of western red cedar, subalpine fir, western hemlock, black cottonwood, and ponderosa pine.

Stand structures and the variability of tree-size classes have been heavily influenced by past natural disturbances and harvest treatments. Insect and disease conditions in the forest include stem decays (primarily in grand fir, but associated with all other tree species) and root diseases (primarily in Douglas-fir, grand fir, and subalpine fir). Mountain pine beetle mortality is still occurring, but has slowed considerably since the epidemic of the 1980s. There are a few small stands of lodgepole pine in the project area, and most of the beetle activity is concentrated in stands of western white pine that were already weakened by blister rust. Dwarf mistletoe is most noticeable in the western larch stands where growth has been suppressed, but very little mortality has occurred. There is a range of other stem decays, root diseases, insects infestations, and foliar pathogens present, all of which influence the variability of the stand structures and size classes represented in the project area.

CUMULATIVE IMPACTS OF PAST MANAGEMENT ACTIVITIES

Historical data records provide forest health and economic status for the Chicken/Werner Project area dating back to 1928. The early field notes indicate that the area was thought to have marginal timber value, poor access, and some sheep

grazing potential. Section 31, which is adjacent to the project area and located along Swift Creek, appears to have the earliest records of commercial timber harvesting in the vicinity. A harvest of approximately 2.5 MMBF took place in the 1930s.

Between 1933 and 1941, numerous roads were constructed to access Werner Peak Lookout and forest land along the Swift Creek drainage towards Upper Whitefish Lake. Approximately 2,000 acres of the project area were commercially logged at this time, and 16 MMBF had been removed by 1960. Large western larch and Douglas-fir tie logs comprised most of the volume removed in the early harvests; only a few MMBF of Engelmann spruce, red cedar, and western white pine were removed during the tie-log harvesting.

Following the 1950s' harvest, the residual stands were mostly stocked with young shade-tolerant species such as grand fir, subalpine fir, and Douglas-fir. Most of the cull trees and less desirable species were also left behind in the 1950s. The result was a significant increase in growth rates and vigor after the overstory of large dominant trees was removed. Today, most of the stands that were previously logged are overstocked with smaller diameter shade-tolerant tree species (grand fir and subalpine fir), while adequate proportions of seral-type species (western larch, Douglas-fir, and western white pine) are lacking. This may be partially attributed to active fire suppression in this century.

Several small salvage sales and regeneration harvests took place in the Chicken/Werner Project area between 1960 and 1995. Less than 1 MMBF of timber was removed from the project area during the last 3 decades. Much of this harvesting was done as seedtree-type regeneration cuts to promote more seral species and forage for big game. In addition, other product sales have occurred in the area, including firewood and Christmas trees and boughs.

On adjacent ownership, harvesting activities have occurred on both PCTC and United State Forest Service (USFS) lands. The PCTC land to the south and west of the project area has been managed, primarily, for timber production over several decades. The forested stands on PCTC's ownership are similar in tree age and species composition to adjacent Stillwater State Forest stands. The average stand stocking levels and volume per acre are generally lighter in PCTC stands due to recent harvesting activities. USFS land (FNF) on the east side of the Whitefish Divide is managed by Glacier View Ranger District, while the west side is managed by Tally Lake Ranger District. There are several hundred acres of old harvest units on the east side of Werner Peak where Glacier View Ranger District built roads and harvested timber between the 1960s and 1980s. Most of these stands are well regenerated in seral species that are large enough to provide hiding cover for wildlife. Tally Lake Ranger District has done some harvesting 2 to 3 miles south of the project area, but activities have been limited in recent years.

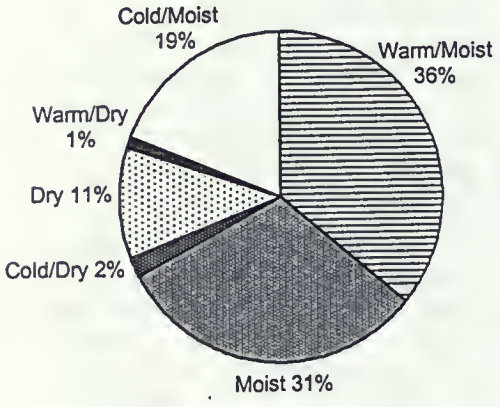
HABITAT TYPES

Forest habitat types (Pfister et al, 1977) are used to describe the vegetation of a site. They have been grouped to indicate the severity and frequency of wildfires that historically occurred on a site *(INT 223; Fischer and Bradley, 1987)*. The subalpine fir habitat type includes approximately 52% of the project area; the grand fir, 30%; the whitebark pine, 10%; and the red cedar, 8%. These habitat types indicate microclimates of the area they represent; for instance, much of the grand fir habitat type occurs on warm, moist sites, while

the subalpine fir habitat type tends to occur on the cold dry and cold moist sites. *(See Figure III-2 [TIMBST97 Database]).*

These habitat types indicate a range of dry to moist climatic regime with vegetative potential limited by the temperature and length of growing season. These sites generally support a rich diversity of trees

FIGURE III-2 - HABITAT TYPES GROUPED BY MICROCLIMATE (% OF CHICKEN/WERNER PROJECT AREA)



and other plant species. Productivity is largely dependent upon elevation, with the lower elevations rating high in productivity and the higher elevations rating low to moderate.

AGE-CLASS DISTRIBUTION

Age-class distributions delineate another characteristic important for determining average historical or appropriate conditions. When distributions are combined with information on cover types, a fairly clear picture emerges of the average forest conditions over time. Knowledge about local topographical effects, ecological characteristics of tree species, climatic-vegetation relationships, and disturbance regimes adds clarity to the picture of appropriate conditions.

The 1930s' inventories quantified the ages of forest stands. Losensky examined the data and projected the stands back in time to the early 1900s to arrive at age estimates. This data is useful in setting baseline conditions for determining the extent to which current forest age-class distribution deviates from average historical conditions.

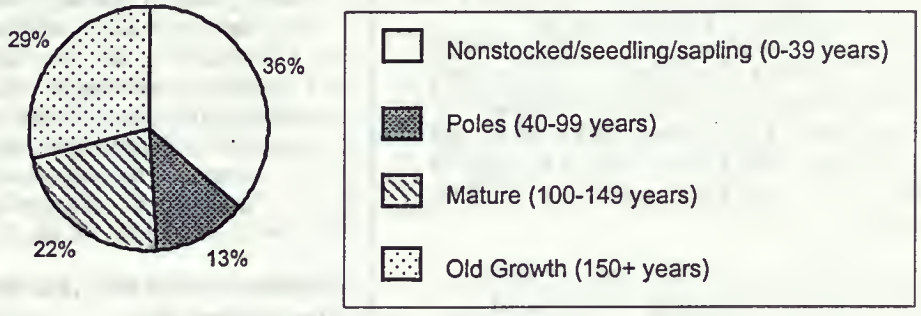
Figure III-3 compares the current condition of age classes on Stillwater State Forest and the historical conditions from the Upper Flathead Valley. Figure III-3 also shows the age-class distribution in the Chicken/Werner Project area.

Comparing the entire Stillwater State Forest with historical data from the Upper Flathead Valley shows that Stillwater State Forest is low in stands of the seedling/sapling age class and higher in stands that are old, relative to historic data. The Chicken/Werner Project area is relatively small and, given the typical large size of a natural disturbance, should be viewed to simply show the age/class representation in the project area. This area has a high percentage of old stands (52%) and a very low percentage of seedling/sapling stands (2%). This age-class-structure representation in the project area indicates the lack of large stand-replacement events, such as wildfire, in the area for the last 100+ years. Eighty-five percent of the pole-sized stands in the area are subalpine fir, a result of understory release following past logging activities and fire exclusion throughout the forest. In areas where past harvest activities and natural fires significantly disturbed these sites, the remaining 15% of pole-sized stands are made up of lodgepole pine.

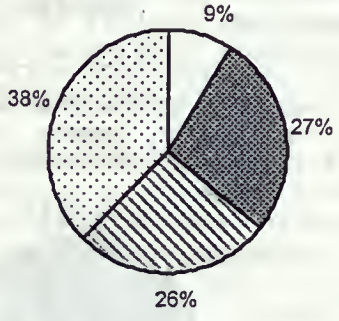
Table III-1 summarizes the actual acres by age class found in both the project area and Stillwater State Forest. This information enables

FIGURE III-3- PERCENTAGE OF AREA IN VARIOUS AGE CLASSES (AGE-CLASS DISTRIBUTION VALUES REPRESENT THE PERCENT OF TOTAL FORESTED ACRES)

HISTORIC CONDITION UPPER FLATHEAD VALLEY



CURRENT CONDITION STILLWATER STATE FOREST



CURRENT CHICKEN/WERNER CONDITION

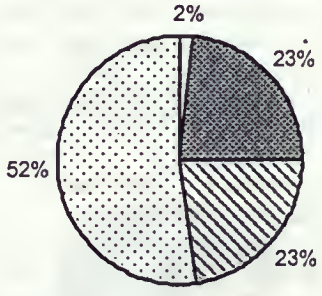


TABLE III-1 - AGE-CLASS DISTRIBUTION (ACTUAL ACRES - *TIMBST97 Database*)

GEOGRAPHICAL AREA	NONSTOCKED/ SEEDLING/SAPLING (0-39 YEARS OLD)	POLES (40-99 YEARS OLD)	MATURE (100-149 YEARS OLD)	OLD GROWTH (150+ YEARS OLD)
Current Condition Stillwater State Forest	8,189	24,569	24,087	34,301
Current Chicken/Werner Condition	66	868	845	1,940

the reader to make a better comparison when using the Environmental Effects Table in Chapter II. Acres of individual age classes for the Historic Condition of Upper Flathead Valley are not included due to the lack of available information.

COVER-TYPE REPRESENTATION

Figures III-4 through 7 illustrate the percentage of forested ground that is/was occupied by a particular cover type. The comparison shown includes the Upper Flathead Valley historic data, current conditions on Stillwater State Forest, and appropriate conditions on Stillwater State Forest and current conditions within the Chicken/Werner Timber Sale Project area that were derived from current data and run through a filter, as described earlier in this chapter.

Data indicates, as illustrated by *Figures III-4 through III-7 and Table III-2*, that the mixed-conifer and subalpine fir stands are currently overrepresented in reference to both historic conditions and conditions that DNRC feels would be appropriate using historic data. Subalpine fir and many of the species that make up the mixed-conifer cover types are shade tolerant and increase in the species component of stands as the interval between disturbances, such as wildfire, is lengthened. The western larch/Douglas-fir cover type is currently underrepresented on the forest in reference to historic data; western larch is not shade tolerant and the species has historically been perpetuated through fairly intensive disturbances, such as wildfires. This data sort indicates that the current amount of western white pine cover type is similar to what occurred historically; however, white pine blister rust infestations have drastically affected western white pine. In reality, the number of healthy western white pine that occupy the canopy as overstory dominants has been on the decline for several decades across most of the Pacific Northwest; the Chicken/ Werner Project area is no exception.

Summary of Age-Class and Cover-Type Representation

Forest cover types within the Chicken/Werner project area are, generally, typical of those found throughout Stillwater State Forest. When compared with Stillwater State Forest, the project area has an unusually high number of acres in old-growth stands with subalpine fir cover types. The percentage of western larch/Douglas-fir cover type represented in the project area is appreciably lower than the amount on Stillwater State Forest. Although some cover types and age classes appear to be underrepresented or

TABLE III-2 - COMPARISON OF EXISTING AND DESIRABLE FUTURE CONDITION FOR STILLWATER STATE FOREST (FORESTED ACRES BY COVER TYPE [*TIMBST97 Database*])

COVER TYPE	CURRENT CONDITION CHICKEN/WERNER PROJECT AREA	CURRENT CONDITION STILLWATER STATE FOREST	APPROPRIATE CONDITION STILLWATER STATE FOREST	NUMBER OF ACRES ABOVE OR BELOW THE APPROPRIATE CONDITION
Ponderosa pine	0	31	31	0
Douglas-fir	0	745	1,046	301 acres below
Western larch/ Douglas-fir	126	20,187	39,385	19,198 acres below
Western white pine	690	8,811	9,074	263 acres above
Lodgepole pine	166	10,432	9,974	458 acres above
Mixed conifer	1,080	21,949	8,323	13,626 acres above
Subalpine fir	1,624	28,321	22,679	5,642 acres above
Other	35	670	634	36 acres below
Total forested acres	3,721	91,146	91,146	N/A

overrepresented within the project area, this area is not large enough to manage for age classes and cover types proportional to historic conditions.

One of DNRC's objectives is to manage for cover types and age classes representative of those that existed here historically. As may be seen in *Figures III-3 through III-7*, the Historic Upper Flathead Valley was more heavily comprised of young seedling/sapling stands with a lodgepole pine or western larch/ Douglas-fir cover type. Just as wildfire plays a key roll in the distribution of age classes and cover types, timber harvesting allows us to manipulate the age and species composition of forested acres. Harvest treatments within project areas on Stillwater State Forest help contribute to the overall objective of maintaining historically representative forested stands. *Figures III-3 through III-7* indicate areas of the Chicken/Werner Project area where forest management might be focused in order to shift current Stillwater State Forest conditions toward historic-type conditions.

FIGURE III-4 THROUGH III-7 PERCENTAGE OF FORESTED ACRES BY COVER TYPE (TIMBST97 DATABASE)

- Western larch/Douglas-fir (WL/DF)
- Western White Pine (WWP)
- Lodgepole Pine (LPP)
- Ponderosa Pine (PP)
- Mixed Conifer (MC)
- Douglas-fir (DF)
- Subalpine Fir (SAF)
- Other types (TRACE)

FIGURE III-4

HISTORIC
UPPPER FLATHEAD VALLEY

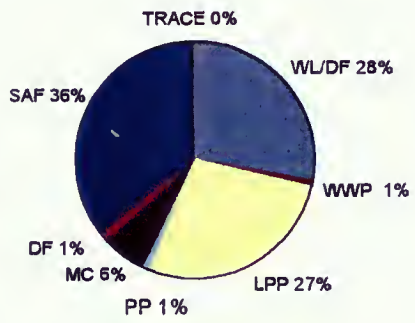


FIGURE III-5

CURRENT CONDITION
CHICKEN / WERNER PROJECT AREA

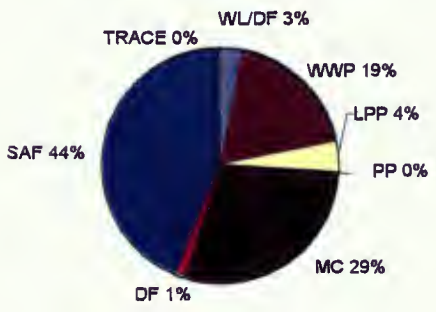


FIGURE III-6

CURRENT CONDITION STILLWATER
STATE FOREST

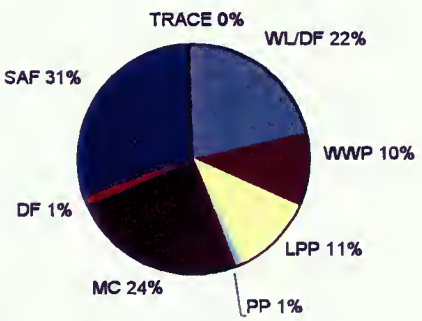
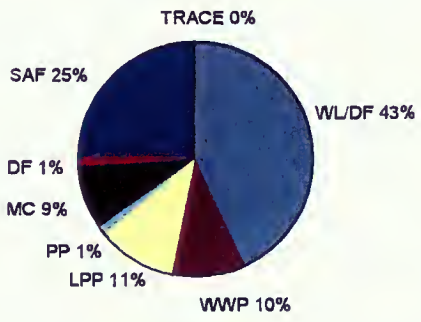


FIGURE III-7

APPROPRIATE CONDITION STILLWATER
STATE FOREST



PATCH CHARACTERISTICS

Historically, wildfire was the most prevalent natural-disturbance mechanism, creating mosaics of vegetation patches of varying age classes and cover types. Today's forest pattern is the remnant of the large modeling patterns of past fire and incremental modeling of harvesting activities. Decades of incremental harvests have diversified the larger, natural-burn patterns, resulting in smaller, more numerous patches across adjoining ownerships.

Because historic wildfires were often larger than the Chicken/Werner Project area, this patch analysis encompasses the contiguous Stillwater State Forest rather than the project area itself. The current mean-patch size on Stillwater State Forest over all cover types and age classes is approximately 120 acres, which is considered smaller than what existed in this area historically or prior to 1900. *Table III-3* and *Table III-4* show the existing condition of patch size and shape for cover types and age classes on Stillwater State Forest.

Patch shape is based on an index of surface-to-area ratio that shows a relationship between the edge of a stand and the amount of area within that stand. The edge of different cover types and age classes in forest stands is directly related to the amount of area that specific wildlife species, depending upon their individual habitat and foraging needs, will utilize. Patch size is expressed in acres for patches of equivalent cover type. Patch shape was derived with the patch shape index of McGarigal and Marks (1994). The patch shape index of McGarigal and Marks (1994) calculates patch complexity. The calculation uses the perimeter and area of each patch and corrects for the effects of patch size. A perfectly square patch takes a value of 1 while circular patches have a complexity value of less than 1. A more irregular shape, such as a star, would take on a value of higher than 1.

Generally, the average patch size has had a slightly decreasing trend in the absence of large-scale wildfires or harvest units that are designed on the size scale of historic-type stand-replacement burns. Modern mapping techniques and more detailed stand-level inventories have contributed to the decrease in patch size; in the past, multiple stands were often combined in order to simplify the mapping process; therefore, the average historic patch size of these combined stands was actually larger.

Note for Tables III-3 and III-4: SLI data (5/18/99) incorporates current inventories and known effects for completed and ongoing timber sale projects. The cumulative effects in, Chapter IV, will include known effects of upcoming timber sale projects where the Record of Decision has gone out.

TABLE III-3 - PATCH SIZE INDEX BY COVER TYPE ON STILLWATER STATE FOREST

COVER TYPES	PATCH SIZE (ACRES)		PATCH SHAPE (ACRES)	
	Mean	Median	Mean	Median
Subalpine fir	306.6	21	1.59	1.35
Douglas-fir	28.7	17.7	1.34	1.25
Lodgepole pine	87.6	18.5	1.57	1.43
Mixed conifer	133.5	28.8	1.77	1.53
Nonforest	24.9	13.3	1.65	1.56
Ponderosa pine	30.9	30.9	1.74	0
Western larch/ Douglas-fir	118.3	24.6	1.53	1.36
Western white pine	176	49.8	1.89	1.66
Water	11.3	9.7	1.40	1.35

TABLE III-4- PATCH SHAPE INDEX BY AGE CLASS ON STILLWATER STATE FOREST				
CURRENT AGE CLASS	PATCH SIZE (ACRES)		PATCH SHAPE (ACRES)	
	Mean	Median	Mean	Median
0-39 YEARS	35.3	16.1	1.37	1.27
40-99 YEARS	144.0	18.9	1.57	1.41
100-149 YEARS	90.0	24.9	1.57	1.42
150+ YEARS	276.0	34.3	1.84	1.51

OLD-GROWTH REPRESENTATION

Background and Analysis Methods and Areas

- *Background*

The SFLMP states that DNRC would seek to maintain or restore old-growth forests in amounts of at least half the average proportion that would be expected to occur with natural processes on similar sites *(MT DNRC 1996)*. Old growth must be retained not only in the amounts committed to, but in appropriate proportions and sites across the landscape.

- *Analysis Methods*

DNRC approaches the issue of old-growth retention from the perspective that the characteristics of old-growth stands that make them functionally different than other stands should be defined and managed for.

Although no estimates of historic amounts of old growth are available, there are estimates of historic age-class distributions and accompanying estimates of proportions of old stands. This information is available from a forest inventory conducted in the 1930s across western Montana. Losensky (1997) summarized the 1930s' inventory showing proportional age-class distributions by climatic section. The proportion of old stands within a given analysis area, compared to the climatic section proportion from the 1930s' inventory, is DNRC's numeric criterion for assessing compliance with our commitment to retaining a minimum of 50% of old-growth amounts that would be expected to occur with natural processes on similar sites. DNRC will assess the structural attributes associated with old age that characterize the variety of forest conditions that would have naturally occurred on the landscape. Stands should be assessed as they come up for treatment on a project-by-project basis, keeping some with high old-growth attributes, while possibly harvesting others. Additionally, stands that are not technically old (150+ years) may possess many important old-growth components, serving the old-growth function better than some actual old stands and, thus, should be considered as potential replacement old growth.

The intent of the SFLMP is to maintain enough old growth to meet the specified old-growth commitment, but not drop below that amount. The "at-least-half" amount represents the minimum DNRC has committed to retaining, but does not necessarily represent the maximum desirable for retention.

- *Analysis Areas*

In the old-growth analysis, historic conditions will be displayed from the scale of Climatic Section 333c, which represents the Upper Flathead Valley. Current and appropriate conditions will be displayed on the

scale of the contiguous Stillwater State Forest land base, approximately 91,147 acres, not including water or nonforest land. *(See Figure III-8 in the Stillwater Old Growth Network section [following] for a map of old-growth stands on Stillwater State Forest.)*

OLD-GROWTH COMMITMENTS

Stands with a substantial overstory component of 150 years old and older and at least 4 MBF per acre are considered old-growth stands in this analysis. The exceptions are lodgepole pine stands, which were sorted as old stands if they were 139 years old or older. This working definition will encompass both stands with high and low levels of old-growth attributes and does not determine the quality and value of these stands as wildlife habitat for old-growth-associated . species or other functions of old stands. Old growth is analyzed for these other characteristics specifically in the Vegetation and Wildlife sections of project-specific environmental documents. *Table III-5* shows that approximately 34,249 acres, or 37% of the Stillwater State Forest analysis area, is currently considered old growth. Historic data from the Upper Flathead Valley indicates that old growth stands occupied approximately 29% of the area. Proportions of old-growth acres on Stillwater State Forest exceed the one-half historic commitment in all cover types, with the exception of the western larch/ Douglas-fir cover type, which is

TABLE III-5 - DNRC OLD-GROWTH RETENTION COMMITMENTS ON STILLWATER STATE FOREST(TIMBST97 DATABASE - 3/9/99)

COVER TYPE	COLUMN 1 ACRES OF APPROPRIATE COVER TYPE ON STILLWATER STATE FOREST	COLUMN 2 CLIMATIC SECTION % OF COVER TYPE ACRES THAT WOULD BE OCCUPIED BY OLD GROWTH STANDS ACCORDING TO JACK LOSENSKY'S RESEARCH (1997)	COLUMN 3 DNRC'S COMMITMENT TO 1/2 OF THE OLD-GROWTH FOR EACH COVER TYPE	COLUMN 4 ACRES OF APPROPRIATE COVER TYPE THAT MUST BE OCCUPIED IN OLD-GROWTH STANDS TO MEET DNRC'S COMMITMENT COLUMN 4 = COL. 1 X COL. 3	COLUMN 5 EXISTING ACRES OF OLD-GROWTH ON STILLWATER STATE FOREST
Ponderosa pine	30.9	74%	37%	11.4	31
Douglas-fir	1,046.4	6%	3%	31.0	250
Western larch/ Douglas-fir	39,384.9	47%	24%	9,452.0	8,731
Western white pine	9,074.1	17%	9%	817.0	6,367
Lodgepole pine	9,973.5	5%	3%	299.0	253
Mixed conifer	8,322.9	43%	22%	1,831.0	8,279
Subalpine fir	22,679.1	20%	10%	2,268.0	10,338
Totals	90,511.9			14,717.4	34,249

*As stated in the "Analysis Area" of the this chapter, Stand Level Inventory (SLI) data is subject to change as inventory updates are added to the data base.

approximately 721 acres below the minimum.

The SFLMP calls for the maintenance of sufficient acres to replace old-growth stands that may fall apart, die, burn, or be harvested. The proportions were calculated using a Weibull function for age-class distribution. The Weibull function uses both the fire-return interval and a shape parameter to fit the age-class curve. This curve indicates the proportion of stands needed in each age class in Stillwater State Forest. *Table III-6* shows the cover types and percentages of stands needed in the 110-year and younger age classes and the percentages necessary for the age classes between 110 and 150 years. Age classes cover 10 years (e.g. the 110 class is from 110 to 119 years).

For planning purposes, we primarily concentrate on making sure that we have enough replacement old growth in the 100-to-149-year age class by cover type.

DESCRIPTION OF THE CURRENT NETWORK OF OLD-GROWTH STANDS ON STILLWATER STATE FOREST

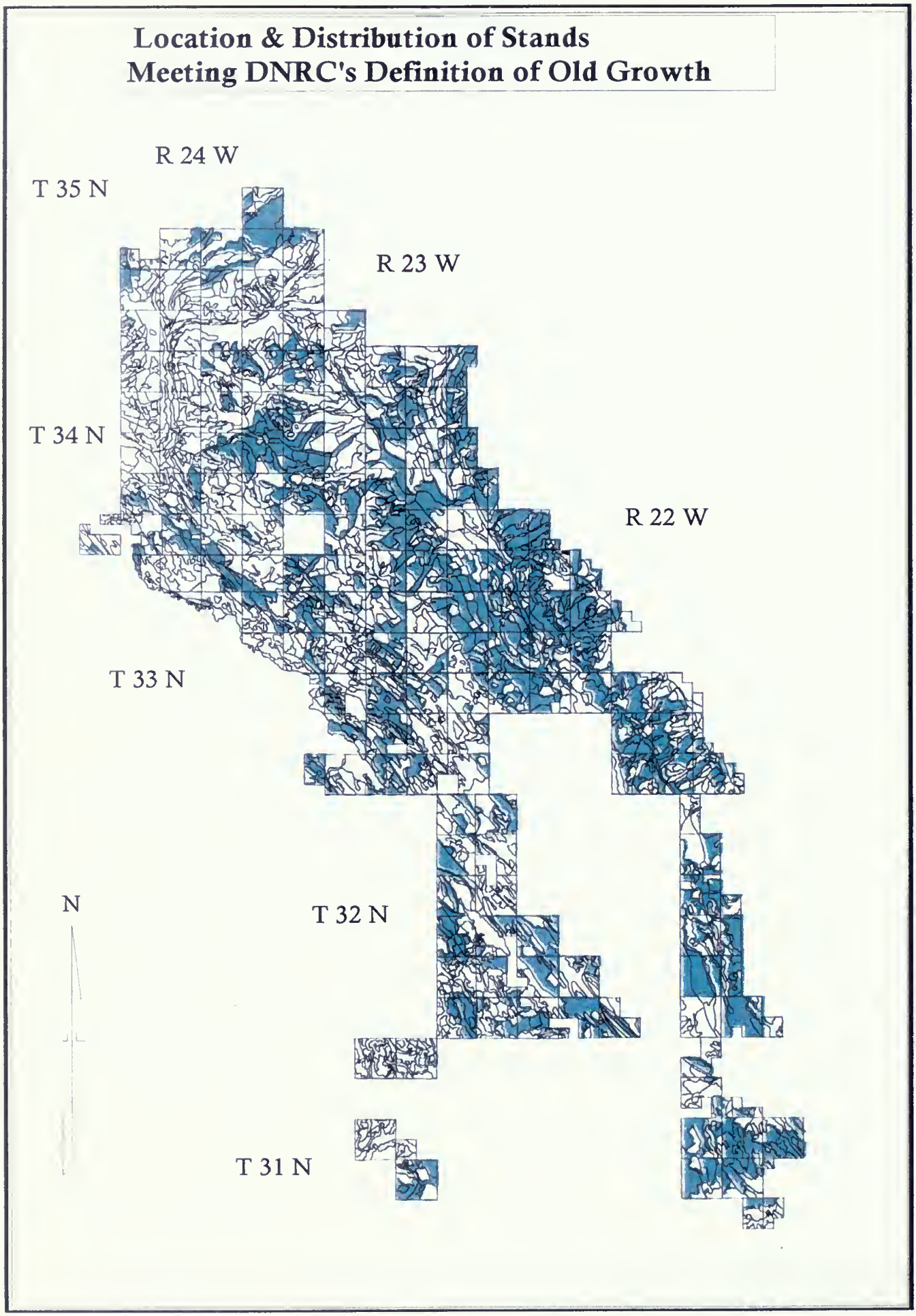
Table III-6, column 4 shows that Stillwater State Forest has approximately 2.3 times as many old-growth acres as DNRC has commitment to retain in the analysis area. In an effort to ensure that old-growth provides habitat for old-growth-associated species is maintained, the analysis also looks at the spatial arrangement of the old-growth situation on Stillwater State Forest; this is helpful for developing and refining alternatives on the project level, as well as analyzing the effects of a proposed action. The current combination of old-growth stands can be viewed as a whole to help in planning. We fully expect that future project-level development, new information, and more extensive on-the-ground reviews of stands that currently are being

TABLE III-6 - STILLWATER STATE FOREST OLD-GROWTH REPLACEMENT SCHEDULE
(based on the Weibull function)

COVER TYPE	OLD-GROWTH MINIMUM PERCENTAGE	MINIMUM PERCENTAGE IN THE 110-YEAR AGE CLASS AND YOUNGER	MINIMUM PERCENTAGE IN EACH AGE CLASS BETWEEN 110 AND 149[1]	PERCENT OF AREA CURRENTLY OCCUPIED IN THE 100-149 YEAR AGE CLASS BY COVER TYPE.
Ponderosa pine[2]	--	--	--	--
Douglas-fir	3%	2.4%	1.0%	32%
Western larch/ Douglas-fir	24%	3.5%	2.5%	33%
Western white pine	9%	3.2%	1.9%	21%
Lodgepole pine[3]	3%	1.8%	0.8%	24%
Mixed conifer	22%	3.5%	2.5%	31%
Subalpine Fir	10%	3.3%	2.0%	29%

[1]The 150-year age class is used because that class in the DNRC inventory corresponds best to Losensky's old-growth stand designations.
[2]Ponderosa pine - no stands are present on the Chicken/Werner Project area.
[3]Lodgepole pine becomes an old-growth stand at 140 years, so the 0.8 refers to the 100-year to 149-year age class.

FIGURE III-8


Location & Distribution of Stands
Meeting DNRC's Definition of Old Growth
R 24 W
T 35 N
R 23 W
T 34 N
R 22 W
T 33 N
N
T 32 N
T 31 N

identified as old-growth will alter the current combination of old-growth stands on Stillwater State Forest.

Timber stands that currently meet DNRC's working definition of minimum old growth on the main block of Stillwater State Forest are, in general, well distributed from north to south and east to west *(see Figure III-8)*. Connectivity from north to south is, generally, continuous. The exception is a gap in the upper reaches of the Stillwater River drainage, where a large patch of lodgepole pine was established following a large fire in the 1920s. This lodgepole pine patch separates some of the northernmost old-growth stands from the rest of the forest's old growth. Old-growth stands are located in the following elevation ranges:

- 37% 3000-3900 feet
- 26% 4000-4900 feet
- 22% 5000-5900 feet
- 15% 6000-7000 feet

The largest contiguous blocks of old-growth stands are in the Swift Creek drainage, which have a higher proportion of western white pine, subalpine fir, and mixed conifer cover types than those located in the Stillwater River drainage. The Stillwater River drainage old-growth stands have a higher proportion of western larch/Douglas-fir cover types. Generally, old growth on the west side of Stryker Ridge is more scattered in comparison with other old-growth stands.

The old-growth stands with the densest stocking, in terms of merchantable timber volume, are in the mixed conifer and western larch/Douglas-fir cover types. The old-growth stands with the largest diameter at breast height (dbh) are in the mixed conifer and western larch/Douglas-fir cover types, with some stands having an average dbh in the 22" to 26" range. The largest individual old-growth stands are from 300 to 334 acres in size and, currently, are mixed conifer and western white pine cover types. Stands that consisted of predominantly western red cedar were, historically, located in and along riparian areas. The western red cedar cover type represented only minor amounts of the region (Losensky, 1993). Because the western red cedar cover type is considered an important riparian-vegetation type, Stillwater State Forest's old-growth stands where western red cedar predominates were examined. Currently, 8 old-growth stands have a large percentage of western red cedar in the overstory, the largest stand being approximately 45 acres in size *(timbst97 database)*.

OLD-GROWTH ATTRIBUTES IN THE CHICKEN/WERNER PROJECT AREA

In this section we will display current conditions in old-growth stands in the Chicken/Werner Project area. Three attributes that often characterize stands in the latter stages of development will be examined:

- large live trees
- coarse down-woody-material
- snags
- vigor/decadence
- structure
- stocking level

Stand attribute data on large live trees, coarse woody debris, and snags is not yet available for the contiguous Stillwater State Forest; therefore, no comparison is made between the entire forest and the Chicken/Werner Project area.

• Large Live Trees

Table III-7 summarizes inventory data on large live trees in old stands on the project area and indicates that roughly half of the old-growth acres (49% of the project area) have a relatively low number (1-5 trees per acre) of 21-inch-diameter or larger trees.

TABLE III-7 - PERCENT OF OLD-GROWTH ACRES OCCUPIED BY LARGE LIVE TREES IN THE CHICKEN/WERNER PROJECT AREA (TIMBST97 DATABASE)

CATEGORIES OF TREES PER ACRE	TREES 17" DBH OR GREATER	TREES 21" DBH OR GREATER
Less than one tree/acre	20%	24%
1-5 trees/acre	9%	49%
6-10 trees/acre	32%	11%
More than 11 trees/acre	39%	15%

Typically, these old-growth stands should have a higher number of trees in the larger diameter classes; there are a number of probable causes for the lack of large trees on these sites, including past logging, marginal growth rates due to high stocking levels, and western larch dwarf mistletoe.

- Coarse Down Woody Material

As seen in *TABLE III-8*, the majority of the old-growth stands within the Chicken/Werner Project area have some form of down woody material that would provide habitat for numerous species of wildlife. Because of the historical frequency of natural fire on the Whitefish Divide and evidence of fire scars on standing trees in the Chicken/ Werner area, it might be assumed that down woody material and logs were consumed in past fires. The most abundant and well-preserved logs are found in draws, stream drainages, and the wet flats below Lower Whitefish Road, areas where fires probably burned less intensively.

- Snags Per Acre

Old-growth stands in the Chicken/ Werner Project area have relatively few high-value snags per acre than would generally be expected in stands of this age. Many of the

TABLE III-8 - LARGE DOWN WOODY MATERIAL PER ACRE IN OLD-GROWTH STANDS ON THE CHICKEN/WERNER PROJECT AREA (TIMBST97 DATABASE)

NUMBER OF LARGE DOWN WOODY LOGS PER ACRE IN OLD-GROWTH STANDS	PERCENT OF AREA WITH DOWN WOODY MATERIAL LARGER THAN 15 INCHES DIAMETER ON THE SMALL END
Less than 1 log per acre	21%
1 to 3 logs per acre	47%
4 to 6 logs per acre	26%
7 or more logs per acre	5%

TABLE III-9 - SNAGS/ACRE IN OLD-GROWTH STANDS ON THE CHICKEN/WERNER PROJECT AREA (TIMBST97 DATABASE)

AVERAGE NUMBER OF SNAGS PER ACRE IN OLD-GROWTH STANDS	PERCENT OF AREA WITH SNAGS 15"-20" DBH	PERCENT OF AREA WITH SNAGS GREATER THAN 21"
Less than 1 snag per acre	19%	25%
1 to 5 snags per acre	38%	72%
6 to 10 snags per acre	41%	2%
11 or more snags per acre	1%	0%

standing large trees and snags were harvested when these stands were entered in the past; however, even the unharvested areas of Section 19 exhibit a relatively low amount of old-growth attributes in the form of large dead and dying trees *(see TABLE III-9)*.

COMPARISON OF OLD-GROWTH STOCKING LEVELS, STRUCTURE, AND VIGOR/DECADENCE (STILLWATER STATE FOREST AND CHICKEN/WERNER PROJECT AREA)

A comparison of old-growth stands on the entire forest with the old-growth stands in the project area is useful to determine how consistent the characteristics of these stands are.

The comparison of characteristics includes stocking levels, structure (single-storied or multistoried), and decadence (as portrayed by vigor class). *See Figures III-9 though III-11.*

Stocking Levels

The stocking level (amount of volume per acre) is a good indicator of tree size and distribution. Higher volumes indicate more densely stocked stands. One value of this measure is that effects of ingrowth and lack of wildfires are minimized because only trees that are 9 inches and larger in diameter are included in the SLI volume estimates.

As may be seen in *Figure III-9*, the old-growth stands in the Chicken/Werner Project area have a low amount of high-volume acres (16,000+ board feet per acre), as compared with Stillwater State Forest, overall. The majority of the old growth in the project area (65%) is comprised of stands with 10 to 15 MBF/acre. The area has full canopy closure and a well-distributed number of trees per acre; therefore, stocking levels indicate that the Chicken/Werner Project area is likely comprised of moderate size trees. If the tree diameters and heights had been larger, then the stocking levels would be much higher.

Stand Structure

The structure of forested stands indicates a characteristic often associated with old-growth, namely whether or not the stand is in a multistoried condition. The multistoried condition arises when:

- a stand has progressed through succession to the point that shade-tolerant species are replacing a shade-intolerant overstory; or
- a stand is already dominated by large, old shade-tolerant species through gap replacement and small

FIGURE III-9 - COMPARISON OF STOCKING LEVELS (VOLUME PER ACRE) OF OLD-GROWTH ACRES (TIMBST97 DATABASE)

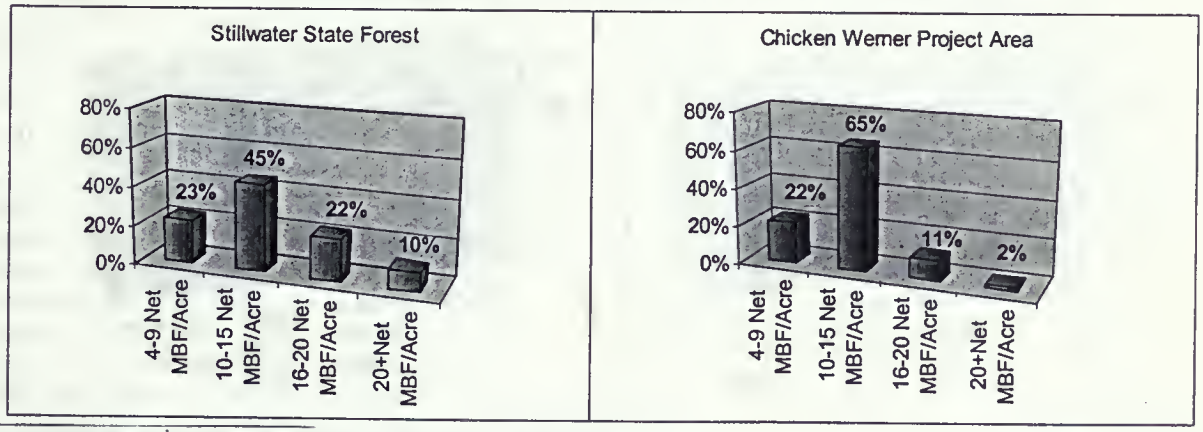
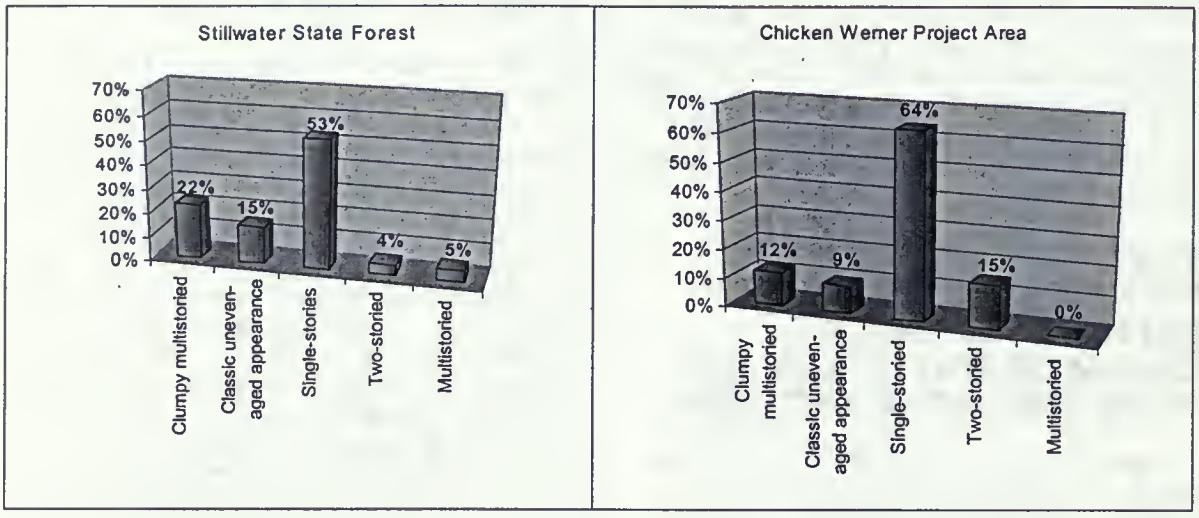


FIGURE III-10 - COMPARISON OF OLD-GROWTH STAND STRUCTURE (TIMBST97 DATABASE)



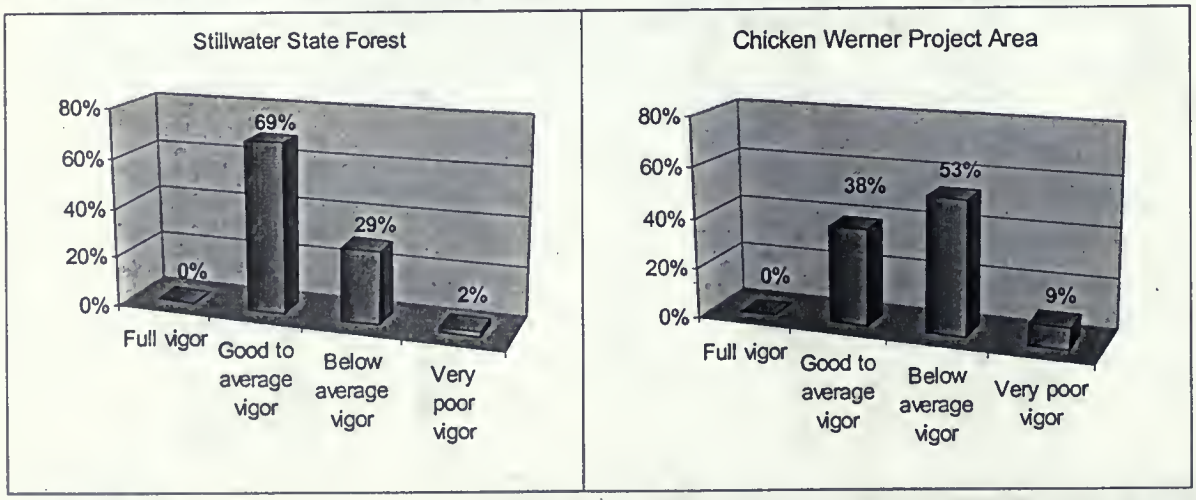
pockets from root rot or blowdown allow the shade-tolerant understory species to release and regenerate to some extent.

The former example is more common in Montana forests. In either case, there is often a long interval of time between major disturbance regimes (ie: fire, disease, or windthrow). The resulting multistoried stand attributes are an important component of old-growth stands. As may be seen in *Figure III-10*, the Chicken/Werner Project area is not appreciably different from the overall Stillwater State Forest in stand structure composition.

Tree Vigor

One of the more valuable characteristics that quantify an old-growth stand is the amount of decadence in the older trees on the site. Indicators of decadence include poor crown development, a dramatic decline in growth rates, and susceptibility to stem decay and damage. SLI crews denoted the level of stand decadence with a range of 4 codes that indicated the level of tree vigor within a stand. A stand with a "full vigor" rating is not in a state of decadence and would have few old-growth characteristics. On the other end of the spectrum, a stand with a "poor vigor" rating

FIGURE III-11 - COMPARISON OF TREE VIGOR IN OLD-GROWTH STAND ACRES (TIMBST97 DATABASE)



would likely display many of the important attributes exhibited by a typical old-growth stand.

When the Chicken/Werner old-growth stands were analyzed, 38% of the acreage had a "good to average" rating for tree vigor. The "below average" rating was assigned to 53% of the old-growth stands and 9% were rated as having "very poor" vigor *(see Figure III-11)*.

SENSITIVE PLANTS

A sensitive plant survey that included the Chicken/Werner Project area was conducted in August 1998. A botanist was contracted by DNRC to perform the survey and document both existing and suitable habitat for plant species of special concern. The findings were submitted to the Montana Natural Heritage Program in Helena.

Two species of special concern were found in a section adjacent to the Chicken/Werner Project area. Mingan Island Moonwort (*Botrychium minganense*) and Mountain Moonwort (*Botrychium montanum)* were found in Section 31, T33N, R22W, an area due west of Werner Peak in a remnant cedar grove on the Swift Creek floodplain. Both species are most likely to occupy sites with a heavy canopy of western red cedar and sparse understory on gravelly alluvium floodplains. The *minganense* species grows in wetter swales while the *montanum* species is usually found on dryer hummocks. In the time since the sensitive plant survey was conducted, the Montana Natural Heritage Program has delisted the minganense species from the list of plant species of special concern (see March 1999 list).

More detailed information about these plants is available in Vanderhorst (1997) for a conservation status of sensitive *Botrychium* species on the Kootenai National Forest (KNF). A complete list of Montana plant species of special concern and an update on their status is also available at the Montana Natural Heritage Programs web site at:

http://orion2.state.mt.us/mtnhp/plants.html

Additional information is available in the Chicken/Werner project file at the Stillwater Unit office in Olney.

The contracted botanist also identified areas of potential *Botrychium* habitat within the Chicken/Werner Project area. These potential habitat zones do not overlap the proposed harvest units in any of the Chicken/Werner management alternatives. Most of the potential habitat zones tend to be extremely wet and exhibit surface or subsurface drainage throughout much of the year.

NOXIOUS WEEDS

The Flathead County Weed/Parks District conducted a survey of the Chicken/Werner Project area during September 1998. DNRC funded the survey of this area and other portions of Stillwater and Coal Creek State Forests. Localized populations of spotted knapweed, St. Johnswort, and oxeye daisy were found along roads in the Chicken/Werner Project area.

The weed district sprayed the identified weeds with a mixture of picloram (trade name: Tordon 22k), surfactant, and water. This treatment would need to be repeated for several consecutive years in order to be certain of long-term weed control.

Given the "open-road use" status of Lower Whitefish Road, a potential for weed-seed dispersal from public traffic exists in the project area and on other open roads throughout Stillwater State Forest. The project area would require future noxious weed inventories and spot herbicide applications to control the infestation or spread of weeds.

AIR QUALITY

Federal, State, and local agencies enforce rules for open controlled burning. Air quality is analyzed by estimating emissions from prescribed broadcast burns and determining where project-related activities would create dust on roads. The air-quality analysis area includes all of Flathead County and is located in Montana Airshed 2; the project area is not located in any of the impact zones. The Montana Airshed Group delineates both.

Temporary reductions in air quality currently exist from the occurrence of wildfire, prescribed broadcast burning, and road dust.

FIRE HISTORY AND CURRENT WILDFIRE HAZARDS AND RISKS IN THE CHICKEN/WERNER PROJECT AREA

Recent fire history for the project area is limited to 15 lightning-caused fires between 1963 and 1997. These fires were quickly extinguished and caused little damage to commercially valuable timber. Eight of the fires occurred near Werner Peak Lookout; others were located near the Lower Whitefish/Jellison/Werner Peak road junction in Section 19. The most recently documented lightning fire was located in Section 32 in 1997; Stillwater State Forest crews were involved in suppressing the fire.

There are a number of older burns caused by lightning-ignited fires in the vicinity. Evidence of past fires are found in the form of scorch marks on the mature western larch and Douglas-fir, as well as fire scars on the uphillside of young subalpine firs. There is also an old burn in Section 33 that appears in aerial photos and USGS Quad Maps prior to 1954.

Consulting research forester, Steve Barrett, conducted an assessment of historical fire regimes for a portion of Stillwater State Forest in February of 1996. Barrett's report may be found in the 1996 Upper Stryker Ridge Timber Sale EIS and at the Stillwater Unit office in Olney, Montana. Barrett used post-1900 archival maps of Upper Flathead Valley to determine the frequency and size of historic fire occurrences in this area. The historic data indicates that Upper Stillwater drainage was affected by numerous fires in 1910, 1926, 1929, and 1934. Fires and plant succession are responsible for the current forest mosaic consisting of an older seral species overstory and an intermediate canopy layer of shade-tolerant trees.

Barrett developed a rough Master Fire Chronology for that area. He determined that many of the older seral species were established after stand-replacing fires in 1730, 1756, 1792, 1813, and 1922. We do not know whether these same fires impacted the Chicken/Werner Project area, but, given the average age of the older seral species in the project area, it is likely that similar events occurred. Most of the large diameter western larch and Douglas-fir are between 170 and 265 years of age. These trees were probably established during large stand-replacement fires and were able to survive the fires of the early 1900s.

Barrett's calculations for fire frequency in the Stryker Ridge area revealed that significant fires occurred every 20 to 100 years and the mean fire interval was 50 years. Barrett's report emphasized that the "50-year mean" is a very conservative figure and extensive sampling is required in order to document every historic fire. For this very reason, it would be difficult to fully assess the normal fire interval for the Chicken/Werner Project area.

A chart referencing Fisher and Bradley's climate types for habitat-type groups was presented earlier in

this chapter (*Figure III-2*). Information on Fire Groups of habitat types and fire's role in forest succession is presented in the technical report, Fire Ecology of Western Montana Habitat Types (*INT 223;Fisher and Bradley 1987*). The report includes fire-frequency data for the habitat groups in each climate type.

As seen in *Figure III-1*, the majority of the Chicken/Werner Project area consists of 3 climate types:

- warm/moist (36%),
- moist (31%), and
- cold/moist (19%).

The warm/moist type is referred to as Fire Group 11 and has a mean fire interval of 100 to 200 years for a stand-replacement-type fire (Antos and Habeck 1981). The moist climate type is listed as Fire Group 9 and has a mean stand-replacement fire frequency of 128 years (Sneck 1977). The last climate group in the project area is the cold/moist group with a more varied fire frequency. This fire group is predominantly a subalpine fir cover type, with occasional whitebark pine stands. At these higher elevations, lightening is the most likely cause of fire and is frequently accompanied by rain and colder temperatures. Fire has a less-severe effect in these areas because tree stocking is sparse and fuel loads are light. The mean fire interval is 200 years, with ranges from 35 to 300 years because of the previously mentioned factors (Romme 1980).

The relatively low fire frequency in these habitat types makes it difficult to speculate on the effect of fire suppression in the Chicken/ Werner Project area. In conclusion, 100 years of active fire suppression has probably altered natural fire intervals, as well as the natural cover-type and age-class distribution throughout the region.

AESTHETICS

Concerns were expressed that harvesting timber in the Chicken/ Werner Project area would have negative visual impacts. Portions of the Whitefish Range are visible from many areas of the Upper Flathead Valley and Highway 93. Glimpses of the project area are visible from the DelRey and Tamarack Creek roads (both are near the head of Whitefish Lake), as well as Stryker Ridge Road. The project area may be distantly viewed from Good Creek Road behind American Timber Mill in Olney. The project area is most visible from Plum Creek land on Upper Whitefish Road between milemarkers 5 and 7. From this vantage point (Sections 3 and 4, T32N, R23W), portions of all proposed harvest units are visible, as well as Werner Peak Road and Werner Peak Lookout.

Currently, the Chicken/Werner area appears as a series of heavily forested ridges and draws along the Whitefish Range. Recent management activities in the Swift Creek valley are hardly visible from any of the vantages listed above. Portions of Werner Peak Road may be glimpsed from across the valley on Upper Whitefish Road, though the road is well hidden by existing trees.

Once the western larch trees change color in October, there is a sharp contrast between the larch and other conifer species across the project area. Larch are well suited to disturbed sites (burned or logged areas) and have grown on many skid trails and roads used during the harvesting of the 1950s. When viewed from Upper Whitefish Road in October, these patterns of skid trails and harvest-area boundaries are highly visible because of the larch foliage.

WILDLIFE

INTRODUCTION

The existing environment is described on 2 scales. The first scale relates to the project area and/or the unit(s) proposed for harvesting. Full descriptions for the project area and scale relates to the surrounding landscape. This scale varies according to the species being discussed. Under each grouping or species heading, the size and description for the cumulative effects analysis area will be defined. If habitat does not exist in the project area, the analysis for that species will be dropped from further consideration.

ANALYSIS METHODS

To assess the existing condition of the project area and the surrounding landscape, a variety of techniques were used. Field visits, scientific literature, SLI data, aerial photography, Montana Natural Heritage Program data, and consultations with other professionals provided information for the following discussion and effects analysis in which they apply.

Coarse-Filter Assessment

DNRC recognizes that it is an impossible and unnecessary task to assess an existing environment or the effects of proposed actions on all wildlife species. We assume that if landscape patterns and processes similar to those that species adapted to are maintained, then the full complement of species will be maintained across the landscape (DNRC 1996). This "coarse filter" approach supports diverse wildlife populations by managing for a variety of forest structures and compositions that approximate historic conditions across a landscape. To compare present and historical conditions across the landscape, the analysis was conducted on the entire Stillwater State Forest using Losensky's historic data and DNRC's SLI data *(refer to Chapter III, Vegetation)*.

The vegetation analysis demonstrates that fire suppression and harvest history led to current conditions that differ from historical conditions reported by Losensky (1997). Mixed-conifer (often shade-tolerant species) and subalpine types increased at the expense of fire-associated lodgepole pine and fire-resistant western larch and Douglas-fir. Most of the stands proposed for treatment follow this trend.

In the project area and on Stillwater State Forest, wildlife species that use forests dominated by Engelmann spruce, subalpine fir, and grand fir probably benefited from this succession at the expense of wildlife species that require lodgepole pine, western larch, Douglas-fir, and nonforested habitats. The shade-tolerant tree species generally provide better snow intercept than do the shade intolerants, thus favoring species that have trouble with deep snow. Conversely, shade-intolerant tree species are often well adapted to fire, having thick bark that allows the presence of heart rot without weakening the entire tree, thus, providing excellent raw materials for cavity-dependent species. Western white pine and whitebark pine tree species declined due to white pine blister rust. Species, such as grizzly bears and Clark's nutcrackers, which feed on whitebark pine seeds, were probably negatively affected by this loss.

Fewer acres were burned on Stillwater State Forest in the recent past, thereby decreasing the abundance of younger forests and nonforested stands and increasing the amount of mature to old stands. Species that use these older habitat types, such as pine marten and brown creepers, may have benefited from this shift in age classes of forest stands. These species may have

younger, more open-forested habitats or temporary openings.

Patch Size (Refer to the vegetative analysis earlier in this chapter for the current condition of patch size and shape.)

Snag and Down Woody Material Management

Snags and down woody material are important for a host of wildlife species. The project area consists mainly of stands with less than 10 snags per acre. Most of these areas contain less than 5 large snags, more than 21 inches DBH, per acre *(refer to Chapter III, Vegetation)*. The snags provide nesting sites for primary and secondary cavity-nesting species, such as the common flicker, barred owl, and black-capped chickadee. The snags are also resting sites for mammal species such as pine marten. The project area primarily contains stands with less than 6 large logs per acre. Downed woody material is important structure for small mammal species, such as the red-backed vole and chipmunk. These conditions occur in relatively closed-canopied forests.

Effects of Cover Type and Age Class on Wildlife

Fine-Filter Assessment

On any particular piece of ground, however, individual species that are recognized to be of special concern are evaluated (a "fine-filter" analysis). Those are addressed below and include:

- wildlife species Federally listed as "threatened" or "endangered",
- species listed as "sensitive" by DNRC and/or USFS for FNF, and
- species managed as "big game" by MFWP.

DNRC would manage to maintain rare or unique habitats and make reasonable attempts to pursue cooperative planning with major adjacent landowners (DNRC 1996).

THREATENED AND ENDANGERED SPECIES

Bald Eagle

The bald eagle is classified as "threatened" and is protected under the Endangered Species Act. Strategies to protect the bald eagle are outlined in the Pacific States Bald Eagle Recovery Plan (USFWS 1986) and the Montana Bald Eagle Management Plan *(Montana Bald Eagle Working Group 1994)*. Management direction involves identifying and protecting nesting, feeding, perching, roosting, and wintering/ migration areas (USFWS 1986, Montana Bald Eagle Working Group 1994).

The two eagle nests closest to the project area, both over 5 miles away, are at Upper and Lower Whitefish lakes. The project area is outside the identified home-range area for both pairs; however, potential habitat may exist along Swift Creek. Because the proposed management treatments will not alter vegetation along the Swift Creek riparian area and no big game winter range occurs in the project area, bald eagle habitat is not expected to be affected. Therefore, eagles will not be discussed any further in this document.

Peregrine Falcon

The peregrine falcon is classified as "endangered" in Montana and is protected under the Endangered Species Act. Strategies to protect and recover populations are outlined in the American Peregrine Falcon Recovery Plan *(USFWS 1984)*.

Peregrine falcons nest on dominant cliffs that generally exceed 200 feet in height; most nests overlook hunting habitat. Peregrines feed almost exclusively on birds in river bottoms, lakes, meadows, marshes, and cropland habitats. In the Rocky Mountains, ponderosa pine and pinyon juniper are the most used forest

types. No such areas exist in or near the project area. Peregine falcons will not be discussed any further in this document.

Grizzly Bear

Grizzly bears are listed as "threatened" under the Endangered Species Act. The Grizzly Bear Recovery Plan defines 6 recovery areas *(USFWS 1993)*. This proposed project is located in grizzly bear habitat in the North Continental Divide Ecosystem (NCDE) recovery area. The NCDE is divided into subunits. Each subunit approximates the size of a female bear's home range and is separated from other subunits based on topography. The Chicken/Werner Project proposal is located in the Lazy Creek Grizzly Bear Subunit (see *Figures III-12 and III-13*).

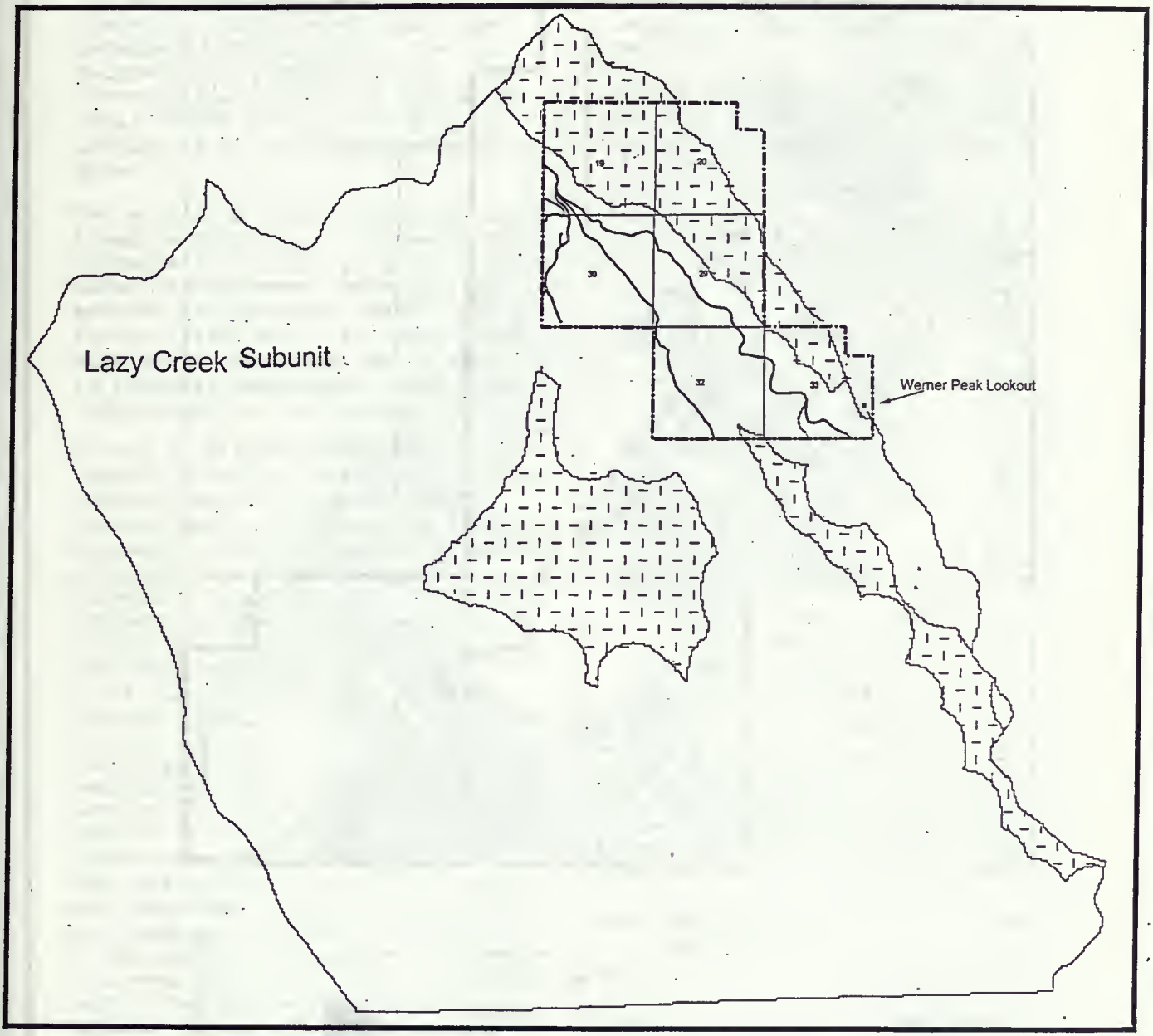
Grizzly bears use their home ranges differently according to seasons. (The habitat quality during spring, summer, and autumn seasons were modeled by Mace et al, in press.) Based on the seasonal maps, most of the habitat values in all seasons for the subunit fall into the low to low-middle range. Spring habitat is distributed throughout the subunit. Proposed harvest Units 12, 13, and 17, and adjacent areas below Lower Whitefish Road provide slightly higher quality spring habitat than other areas. Summer and autumn habitat is limited to the very east side of the subunit. The project area overlaps some of the limited summer and autumn habitat. Field visits confirmed that many of the stands in the project area contain huckleberry (Vaccinium spp.) and other food sources for grizzly bears.

Cumulative analysis was conducted using the Lazy Creek Subunit. This subunit contains approximately 34,564 acres (54 square miles) comprised of PCTC land (15,013 acres), State trust lands (14,520 acres), USFS lands (4,008 acres), and other private lands (1,020 acres).

Hiding cover is believed to become limiting when it drops below 40% of the subunit. Hiding cover is considered to be present where enough vegetation occurs in a stand to hide 90% of a grizzly bear at 200 feet. Hiding cover in the Lazy Creek Grizzly Bear Subunit was reduced by past timber harvests. Presently, approximately 13,393 acres (92%) of State trust lands and 6,005 to 9,008 acres (40-60%) of PCTC lands consist of hiding cover in this subunit. Hiding cover on other ownerships is unknown, but is assumed to be present in all unharvested areas. Therefore, between 62% and 81% of the acres in the Lazy Creek Grizzly Bear Subunit have adequate hiding cover.

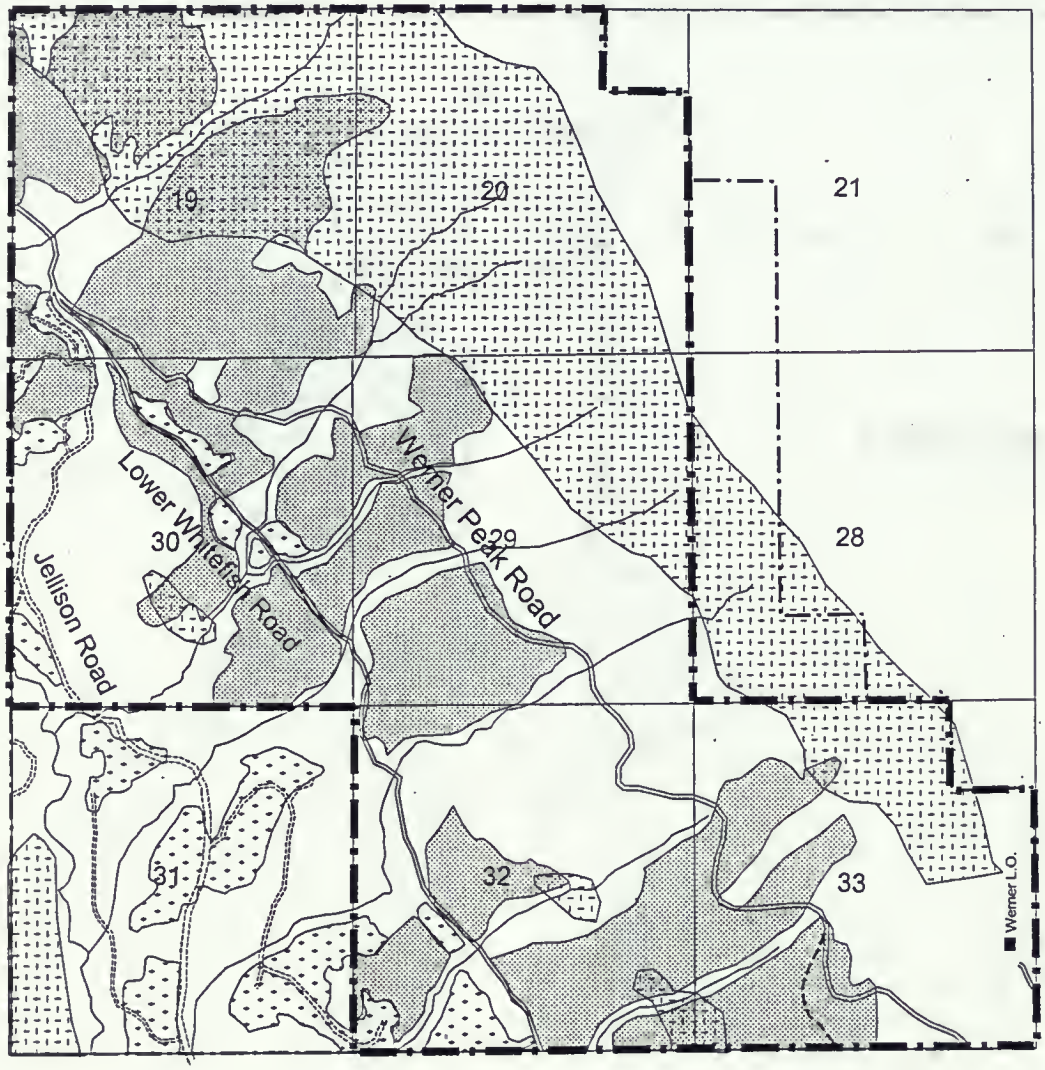
Access management is a major factor in managing grizzly bear habitat. The Interagency Grizzly Bear Committee assigned a task force to define parameters to be used in managing access in the NCDE. Based on the findings of this task force, DNRC, in an internal guidance, adopted a "no net increase" in the amount of area that exceeded 1 mile per square mile and 2 miles per square mile in POR or PTR, respectively. Additionally, DNRC is committed to a "no net decrease in the amount of core areas." The baseline for the "no net" are the values of these parameters at the time of the acceptance of the internal guidance (5 October 1995). To measure these parameters, the EPPL7 computer software *(Minnesota LMIC 1991)* was used to follow the protocol described in AKE (1994). The subunit's POR exceeding 1 mile per square mile is 47%, while the subunit's PTR exceeding 2 miles per square mile is 72%. The security core area is limited to 14% of the subunit in 3 blocks ranging from 910 to 2,184 acres (*Figure III-13*). The 1995 baseline values are 47%, 77%, and 13% POR, PTR, and security core, respectively.

Chicken/Werner
Project Within Lazy Creek Grizzly Bear Sub Unit Subunit



Grizzly Bear Core Area

Chicken/Werner Project Area



Legend

- Open Roads
- Gated Roads
- Proposed Temporary Road
- Project Area Boundary
- Creeks
- Grizzly Bear Core Area
- Proposed Harvest Units

N

Northern Rocky Mountain Wolf

The Northern Rocky Mountain Wolf is listed as "threatened" under the Endangered Species Act. The Northern Rocky Mountain Wolf Recovery Plan defines 3 recovery zones *(USFWS 1987)*. The proposed project is in the Northwest Recovery Zone.

The wolf is a wide-ranging species. Adequate habitat for wolves contains adequate vulnerable prey and minimal human disturbance. Primary prey species in northwest Montana are the white-tailed deer, elk, moose, and mule deer. Distribution of wolves is strongly associated with white-tailed deer winter ranges.

Wolves in northwest Montana typically den in late April. Wolves choose elevated areas in gentle terrain near a water source (valley bottoms), close to meadows or other openings, and near big game wintering areas for dens and rendezvous sites (Matteson 1992). Wolves are most vulnerable to human disturbance at den and rendezvous sites *(Joslin 1967, Carbyn 1974, Chapman 1979)*.

During a December field visit, howling was heard coming from Section 32. Wolves use the project area to an unknown extent. Since no concentrations of big game occur near the project area in the winter, wolf dens and rendezvous sites are not expected to occur. Furthermore, no den sites in or near the project area were documented by USFWS. The terrain below Lower Whitefish Road appears suitable for denning and rendezvous sites. However, no major populations of big game winter in this area, presumably due to high snow accumulations in the project area observed during field visits throughout the winter.

Secure habitat away from roads is an important component of wolf habitat. The open-road density in the project area is 1.2 miles per square mile. Most open roads are located approximately midslope. For more discussion on roads and road effects, refer to the Grizzly Bear section in this Chapter and Chapter IV.

Past harvest units on State trust and PCTC lands near Swift Creek provide feeding opportunities for big game species. These units are generally gentle in topography and near water. For more discussion on big game effects, refer to the Big Game section in this chapter and Chapter IV.

SENSITIVE SPECIES

When conducting forest-management activities, the SFLMP directs DNRC to give special consideration to the following species:

- boreal owl
- Fisher
- Lynx
- pileated woodpecker
- flammulated owl
- black-backed woodpecker
- common loon
- harlequin duck
- Townsend's big-eared bat
- Coeur d'Alene salamander

These species are sensitive to human activities, have special habitat requirements that may be altered by timber management, or may become listed under the Federal Endangered Species Act if management activities result in continued adverse impacts. Because sensitive species usually have specific habitat requirements, consideration of their needs serves as a useful "fine filter" for ensuring that the primary goal of maintaining healthy and diverse forests is met.

Six of these species would not be affected by the proposed project because suitable habitat does not exist in the project area or proposed activities would not affect their required habitat components:

- black-backed woodpecker
- flammulated owl
- Coeur d'Alene salamander

- common loon
- harlequin duck
- northern bog lemming

A search of the Montana Natural Heritage database did not return any documented sensitive species sightings in or near (within 1 mile) the project area; however, habitat may be present in the project area for:

- Fishers
- pileated woodpeckers
- Lynx
- Townsend's big-eared bats
- boreal owls

Boreal Owl

Boreal owls in Montana inhabit mature to old-growth forests at elevations from 5,000 to 8,000 feet. Nesting in the Rocky Mountains has been documented in subalpine forests dominated by subalpine fir and Engelmann spruce. Such forests are structurally complex and have high densities of large trees, shrubby and open understories, and a multilayered canopy. Boreal owls are secondary cavity-nesters, using holes excavated by pileated woodpeckers and flickers. Habitat quality depends strongly on the availability of large snags and trees with cavities suitable for nesting. Boreal owls apparently are not sensitive to human or mechanical disturbance. Effects of forest fragmentation on boreal owls have not been studied, but may not be of high importance due to the low energetic costs of travel by owls (Hayward 1994).

DNRC's SLI data was used to categorize stands in the project area that had the tree species and structural components known to be important to boreal owls. Stands were categorized as boreal owl habitat if the following criteria were met:

- above 5,100 feet in elevation,
- the average tree age in the stand is greater than 149 years,
- canopy cover is greater than 40%,
- the stand is mature and exhibiting at least some signs of decadence, and
- the stand is composed of at least 50% subalpine fir and/or Engelmann spruce.

Using these criteria, a total of 328 acres were identified on the project area as providing boreal owl habitat. Based on the elevational criterion, Units 2 and 9 (55 acres) provide boreal owl nesting habitat. However, under the other criteria, only part of Unit 2 (20 acres) provides adequate habitat for this species. Habitat suitability of these stands was checked through field reconnaissance. In addition to meeting the criteria described above, western larch snags suitable for nesting are scattered throughout. Although fairly sparse, enough snags to provide adequate boreal owl nesting opportunities may exist.

The area along Whitefish Divide (1 mile to the north, south, and east of the project area and above 5,000 feet) was considered for the cumulative effects analysis. In this area, approximately 620 acres of suitable habitat exists. Habitat probably exists on the other side of the Whitefish Divide as well.

Fisher

Fishers are listed by DNRC as a sensitive species due to their use of old-growth habitats (DNRC 1996). Fishers are generalist predators and use a variety of habitat types, but are disproportionately found in stands with dense canopies. Fishers appear to be highly selective of resting and denning sites. In the Rocky Mountains, fishers appear to prefer late-successional coniferous forests for resting sites and use riparian areas disproportionately to the availability. Fishers tend to use areas within 155 feet of water. Such areas contain large live trees, snags, and logs, which are used for resting and denning sites, and dense

canopy cover, which is important for snow intercept *(Jones 1991)*. Additionally, Heinemeyer (1993) found reintroduced fishers in northwest Montana selected elevations between 1,970 and 3,200 feet and avoided elevations between 3,960 to 5,280 feet. DNRC's internal guidance aims at protecting valuable resting habitat near riparian areas and maintaining travel corridors.

The project area ranges from 3,580 to over 7,000 feet in elevation with 7 perennial streams draining the project area. This area ranges in the upper elevational use found by Heinemeyer (1993). No fisher tracks were recorded on MFWP track survey routes (1987 through 1999) in the Upper Swift Creek drainage (Upper Whitefish Lake) and no records of trapped fishers (1979 through 1996) came from the Swift Creek (Whitefish River) drainage *(Tim Their Unpubl.)*. It is unlikely that fishers use the project area to a large extent; however, movement through the project area from Swift Creek to the North Fork drainage is possible.

Trapping is a significant source of fisher mortality. Trapping pressure was responsible for the extirpation of fishers over most of their range by the 1930s. Although they again inhabit this area, populations remain vulnerable to legal trapping; fishers are easily caught in traps set for martens, bobcats, and coyotes. Open and closed roads (snowmobiles may travel closed roads) often facilitate easier travel for humans and influence the fisher's vulnerability to trapping. Open-road density in the project area is about 1.2 miles per square mile and closed-road density is about 0.4 miles per square mile, for a total road density of about 1.6 miles per square mile. Roads run east to west along the slope through the project area and cross all the major creeks in at least one location. Any fishers inhabiting the area would be vulnerable to trapping.

For cumulative analysis, the grizzly bear subunit was used to assess connectivity along and between riparian areas of perennial streams. Based on elevation, the most likely potential fisher habitat exists on PCTC ownership. These areas are intensively managed and probably will not maintain fisher resting habitat in the long-term. Habitat on State trust lands is limited due to elevational gradients.

Lynx

The addition of lynx to the Endangered Species List is proposed. Currently, the lynx is listed by DNRC as a sensitive species. Several tracks were reported near the junction of Lower Whitefish and Werner Peak roads (Tim Their personal communication). One recorded trap mortality in the 1980s (Tim Their 1996) and several lynx tracks were reported in the Upper Whitefish Lake drainage (Tim Their unpublished).

Lynx are associated with boreal and montane forests above 5,000 feet in the Rocky Mountains. Lynx habitat in western mountains consists primarily of coniferous forests with plentiful snowshoe hares, mature forests for denning and cover for kittens, and densely forested cover for travel and security. Lynx usually occur where topographic relief is low. The project area falls within the elevational ranges of the lynx.

Preferred denning sites have abundant downed logs, which provide security and thermal cover for kittens. All or portions of proposed harvest Units 2, 9, 15, and 22 are old stands above 5,000 feet. However, Unit 2 is near an open road, therefore, it does not offer suitable denning habitat. Units 9, 15, and 22 do not offer an abundance of downed wood material or low topographic relief, but may provide some potential denning habitat. Lynx use early to midsuccessional

forested stands for foraging. These stands are lacking in the project area.

For travel, lynx require areas with continuous forest cover. Although lynx will move across openings less than 300 feet wide, open areas discourage use by lynx and interrupt their movements. In general, suitable travel cover consists of vegetation more than 6 feet tall with a closed canopy. Most of the project area provides suitable lynx travel cover.

Trapping is a significant source of lynx mortality. Vulnerability to trapping is largely a function of trapper access and roads, which is discussed under the fisher section, above.

For the cumulative effects analysis, the Lazy Creek Grizzly Bear Subunit was used (*see FIGURE III-12 and III-13 - Project Within Lazy Creek Grizzly Bear Subunit)*. The only other potential denning habitat (based on elevation) existing in the subunit is to the south and north of the project area along the Whitefish Divide. Potential denning and foraging habitat probably exists on the other side of the divide. Based on trapping data, the North Fork drainage apparently provides better habitat (Their 1996). Currently, connectivity between the 2 drainages is present.

Some old harvest units located low on the slope near Swift Creek may provide foraging opportunities. However, to access these harvest units, lynx would need to travel over a mile from potential denning habitat and cross 2 roads. Some snowshoe hare tracks were observed above Werner Peak Road; however, high-quality habitat for snowshoe hare in the area is limited.

Pileated Woodpecker

The pileated woodpeckeer plays an important ecological role by excavating cavities that are used in subsequent years by many other species of birds and mammals. Due to this important ecological niche, DNRC included the pileated woodpecker on their Sensitive Species List.

Pileated woodpeckers excavate the largest cavities of any woodpeckeer. Preferred nest trees are larch, ponderosa pine, cottonwood, and aspen, usually 20 inches dbh and larger *(McClelland 1979, Bull 1980, Aney and McClelland 1985)*. Pileated woodpeckers primarily eat carpenter ants, which inhabit large downed logs, stumps, and snags. Nesting habitat for pileated woodpeckers was described by Aney and McClelland (1985) as "stands of 50-100 contiguous acres, generally below 5,000 feet in elevation with basal areas of 100-125 square feet per acre and a relatively closed canopy." The feeding and nesting habitat requirements, including large snags or decayed trees for nesting and large downed wood for feeding, closely tie these woodpeckers to mature forests with old-growth characteristics (Bull and Jackson 1995). The density of pileated woodpeckers is positively correlated with the amount of dead and/or dying wood in a stand *(McClelland 1979)*.

A quantitative assessment of pileated woodpecker habitat availability on the entire Stillwater State Forest was attempted, but was unsuccessful because the current SLI data did not allow us to identify specific forest characteristics important to pileated woodpeckers. Pileated woodpecker habitat was, thus, identified in the project area through field reconnaissance. Habitat for pileated woodpeckers is available throughout the project area below 5,000 feet, though the quality of habitat varies greatly.

Differences in habitat quality are due to the range of elevations and site potential to grow the large trees that are preferred for nesting, and to past timber harvesting (from the 1950s to the present) that removed many of the large western larch that are preferred for nesting.

High quality habitat is located in the wet, lower elevation portion of the project area in Section 30. This section contains many large cottonwood that should provide nesting opportunities, and a fair amount of downed wood for feeding opportunities. Habitat quality is lower than it would have been historically due to the removal of many of the large trees during the 1950s. High-quality habitat is also located on the wet benches and near streams in the lower elevation areas of Section 19. These areas apparently were not harvested and contain high numbers of large-diameter western larch for nest trees, and other large old trees, Douglas-fir primarily, that should provide feeding opportunities. Individual large western larch trees suitable for nesting are also scattered throughout the project area, especially near riparian areas. There are also many old western larch stumps scattered throughout that provide evidence of past selective harvesting and indicate that the availability of suitable nest trees is lower than it would have been historically.

Scattered large larch trees represent future nesting opportunities. Older trees are much more likely to have heart rot and are preferred over younger trees for nesting. Allowing some trees to grow old and large and develop rot is essential to maintaining pileated woodpecker populations. Many factors determine whether or not a tree will develop heartrot and become a good wildlife snag. In general, a high incidence of heartrot and a corresponding high number of good wildlife trees exist in old growth, but a relatively small proportion of trees are allowed to grow old and develop heartrot in managed forests *(B. Ingram 1997)*. Many trees retained for snag recruits are lost to windfall and firewood cutters *(Hillis 1993)*. To account for this, about 4-6 snag recruits per acre are needed for each desired future snag *(Hillis 1997)*.

For the cumulative effects analysis, an area of approximately 1 mile around the project area was considered. This area includes approximately 4,160 acres (including the project area) of potential pileated woodpecker habitat. On State trust lands, approximately 400 acres of pileated woodpecker habitat was removed through past timber harvesting. On PCTC, timber harvests have removed much of the pileated woodpecker habitat to the west of the project area.

Townsend's Big-eared Bat

These bats roost and breed communally in groups from 12 to 200 individuals in caves, mine shafts, rock outcrops, lava tubes, and, sometimes, buildings. Tree cavities are occasionally used as roosts. This species is probably limited by the number of suitable communal roost sites surrounded with adequate foraging habitat. Townsend's big-eared bats are thought to be widely distributed throughout the northern region *(USFS 1989)*. This species is extremely sensitive to human activities and have been known to permanently abandon roost sites in response to disturbance, recreational cave exploration in particular. The rocky outcrops near Werner Peak and the scattered large cottonwoods in Section 30 may provide roosting habitat.

HABITAT (SPECIAL AND UNIQUE)

No special or unique habitats were found in any harvest units or in the project area.

BIG GAME SPECIES

MFWP delineated major winter ranges for big game species for the State. No winter ranges were delineated in the project area. Mule deer, white-tailed deer, elk, and moose use the area in the nonwinter period. Occasionally, moose may use the project area in the winter. The project area contains 2,498 acres (64%) of thermal cover, including larch thermal cover, and 3,527 acres (93% of hiding cover. Approximately 293 acres (7%) of the project area does not provide hiding or thermal cover. Travel corridors allow unimpeded movement through the project area.

For the cumulative effects analysis, a 1-mile buffer around the project area was considered. Past timber harvesting on PCTC and State trust lands near Swift Creek removed hiding and thermal cover. The State trust land harvest units are small enough to be used by big game, while PCTC units are large and probably only receive use near the adjacent unharvested areas or in those portions of the units where hiding cover is reestablished.

ROADS

Currently, there are 3 road systems that provide access to most of the Chicken/Werner Project area *(See Alternative Maps in Chapter II)*. According to Tom Vars, former Stillwater Unit Manager, these roads were built during the 1930s and 40s by the Civilian Conservation Corps (CCC) under direction of the Army Core of Engineers. Road building began on Lower Whitefish Road between 1933 and 1935 to provide access for logging and fire suppression. In 1939, prior to the outbreak of World War II, Werner Peak Road became the last significant CCC project on Stillwater State Forest. Werner Peak Lookout was replaced in 1941; the road to the lookout was not used for logging until the 1950s.

Most of the road segments have been upgraded or repaired several times. In recent years, DNRC has spent a great deal of time and money to improve water quality and minimize road-source sedimentation through the use of BMPs. BMPs consist of precautionary measures used during logging, road-building, road-improvement, or stream-crossing projects in order to minimize negative effects to the environment. Forest land managers recognize that roads are a continual source of sedimentation and require long-term maintenance. DNRC has addressed this problem by minimizing new road construction and improving existing roads. These improvements have been made on many forest roads and usually include one or more of the following:

- installation of rollover dips or rubber flappers to drain road surfaces,
- replacement of inadequate (too small, too short, rusted, or plugged) culverts,
- installation of ditch-relief culverts to prevent ditchwater from flowing directly into a stream,
- bridge replacement,

- pulling ditches along cutslopes to channel surface runnoff through ditch-relief culverts rather than down the road surface, and
- installation of gates to seasonally close roads during spring thawing or extended rain events when roads are most vulnerable to damage from vehicle tires.

Lower Whitefish Road is a main access route that extends 14 miles from the head of Whitefish Lake to Upper Whitefish Road. Approximately 2 miles of Lower Whitefish Road run through the center of the Chicken/ Werner Project area. This road is open to the public, except when a seasonal restriction is enforced with gates in the spring. Extensive repairs and improvements were recently made to the Lower Whitefish road system; DNRC closes the road each spring to protect this investment.

Lower Jellison Road begins near milemarker 10 on Lower Whitefish Road in Section 19. Extensive road improvements have also been made to Lower Jellison Road and a year-round road restriction is in place. The road accesses both State and PCTC forestlands and ends on PCTC ownership. Two short spurs connect Lower Jellison Road with older timber sale units in Sections 30 and 31. These spurs need minor BMP work (culvert replacement and surface drainage) to meet our guidance.

Werner Peak Road, approximately 5.2 miles in length, begins at the same junction as Lower Jellison Road and provides access to Werner Peak Lookout in Section 33 of the project area. A portion of the road crosses USFS land on Tally Lake District. The southern boundary of Section 33 in the project area is on an avalanche chute at the 4.1 milemarker of Werner Peak Road. The road continues beyond this point and separates at a junction. The road to the left runs north to Werner Peak Lookout, while the road to the south becomes USFS Road 1658, which eventually connects with the North Fork (of the Flathead River) Road.

Werner Peak Road, a 60-year-old road, was constructed prior to the stringent BMP standards commonly used today. Despite this, the road has provided years of access for timber harvesting, recreational use, and fire suppression with only minor repair or maintenance work required. Currently, Werner Peak Road is a low-standard secondary road where many of the drainage features are no longer functioning properly. Most ditches are silted in and many of the ditch-relief culverts are plugged or completely buried because they are too short to allow for road-surface grading. Most of the larger culverts that cross perennial streams are too small to meet today's standards for peak runoff flow calculations in 100-year storm events.

The road grade is unusually steep (6% to 12%) and segments of the road are in poor condition where exposed boulders and slumping edges are visible. In addition to the needed repair work listed above, some safety modifications would be required to move Werner Peak Road from an existing low-standard transportation system to one of moderate standards that would meet our guidance for a secondary road. *(Refer to Chapter II, Alternative Maps.)*

ECONOMICS

CURRENT CONDITIONS

As of the spring of 1999, the stumpage market appears to be strengthening in terms of the number of bidders and the amount of winning bids. Demand from the seller's perspective for timber sales in the northwest region of Montana (Flathead, Lake, Lincoln, and Sanders counties) is fair and the future outlook is uncertain. The future may include a gradual increase in wood-product prices as the global economy slowly recovers, or the U.S. economy could slow down, leading to a further reduction in stumpage value.

Based on a past study, The Role of the Wood Products Industry in the Economy of Flathead County, Montana, An Estimate of the Effects on Total Employment Using Input-Out Analysis, 20% to 35% of the economy of Flathead County can be attributed to the wood-product industry. The estimated economic effect of the wood product industry was determined primarily with the use of the computer program *Micro Implan*, an economic impact model based on county-level economic data *(Beckley, 1994)*.

PAST HARVESTS IN THE CHICKEN/ WERNER PROJECT AREA

Table III-10 is a review of past harvesting activity in the Chicken/ Werner Project area. These estimates of past activity are from the section record cards, which are located in Missoula. The volume is only for products that were entered into the section record cards as board feet. The value includes all products that were recorded. The grant abbreviations are as follows:

A.C.B. - Montana State University,
A.C.I. - Montana State University-Morrill,
C.S. - Common School
D.&D.A. - Deaf-Blind School

The total value for each grant will be displayed as both a nominal value and a real value in 1997 dollars. The nominal or current dollars are as they actually occurred in a given year, including inflation. Total Value 1997 Dollars or constant dollars do not include inflation. The nominal or current dollars are adjusted based on an estimate of inflation.

PAST COSTS AND REVENUES FROM DNRC'S FOREST SALE PROGRAM

DNRC does not have a formal accounting system to track costs for individual projects from start to finish. An annual cash-flow analysis is conducted of the DNRC forest-product-sales program. Revenue and costs are calculated by land office and at the Statewide level. The revenue-to-cost ratios are a measure of economic efficiency. A ratio value less than 1.0 means that costs are higher than revenues (losing money). A ratio greater than 1.0 means revenues are higher than costs (making money). A ratio equaling 1.0 means that costs equal revenues. The ratio for NWLO was 3.33 for fiscal year 1994, 2.41 for 1995, 1.51 for 1996, 1.52 for

TABLE III-10 - HISTORICAL HARVEST VOLUME (MBF), TOTAL VALUE IN NOMINAL DOLLALRS AND TOTAL VALUE IN 1997 DOLLARS

GRANT	TOTAL VOLUME (MBF)	TOTAL VALUE NOMINAL DOLLARS	TOTAL VALUE 1997 DOLLARS
A.C.B.	2,259	38,707	205,393
A.C.I.	5,267	130,024	470,950
C.S.	9,121	203,271	823,417
D.& D.A.	242	3,981	21,575
Totals	16,889	375,983	1,521,335

TABLE III-11 - THE NET REVENUE/COST RATIOS (TIMBER SALE ACCOUNTING SUMMARY)					
	TOTAL REVENUE/TOTAL COST RATIO				
FISCAL YEAR	FY94	FY95	FY96	FY97	FY98
NWLO	3.33	2.41	1.51	1.52	1.58
Total Program	2.68	2.07	1.68	1.89	1.72

1997 and 1.58 for fiscal 1998. For the last 2 years, for every $1.00 spent on costs, NWLO generated $1.55 in revenue. (*Refer to TABLE III-11.)*

Total revenue is revenue from timber sales, permits, forest improvement (FI) and road maintenance; total cost is the sum of timber operating and general administration costs.

WATERSHED

The proposed project area is drained by a series of first-order stream channels along the west face of the Whitefish Range. The most well developed creek in the project area is a second-order stream that flows through Sections 20 and 30. These streams are tributaries to Swift Creek. Swift Creek is a fourth-order stream that is the primary input of surface water to Whitefish Lake. The first- and second-order watersheds in the project area are steep gradient in the upper reaches, but become low gradient when they reach the valley bottom. In the headwater reaches close to the ridges, these streams are intermittent, flowing only during snowmelt and high precipitation events. In the valley bottom, they are primarily perennial, interacting with groundwater and the high water table. Annual precipitation in the project area ranges from 25 inches in the valley bottom to 60+ inches near the ridges.

REGULATORY FRAMEWORK

Surface Water-Quality Standards

This portion of the Flathead River drainage, including Swift Creek and its tributaries, is classified A-1 by the Montana Surface Water Quality Standards. Waters classified A-1 by the standards must be maintained suitable for drinking, culinary, and food processing purposes after conventional treatment for removal of naturally present impurities. Water quality must be suitable for:

- bathing, swimming, and recreation;
- growth and propagation of salmonid fish and associated aquatic life, waterfowl, and furbearers; and
- agricultural and industrial water supply.

Among other criteria for A-1 waters, "no increases are allowed above naturally occurring concentrations of sediment..." and "No increase above naturally occurring turbidity is allowed..." Naturally occurring includes conditions or materials present from runoff on developed land where all reasonable land, soil, and water conservation practices (commonly called BMPs) have been applied. Reasonable practices include methods, measures, or practices that protect present and reasonably anticipated beneficial uses. These practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Appropriate practices would be applied before, during, and after all proposed management activities.

Water-Quality-Limited Waterbodies

The main stem of Swift Creek is named in the 1998 Waterbodies in Need of Total Maximum Daily Load (TMDL) Development publication produced by the Montana Department of Environmental Quality (DEQ). The listed probable causes of impairment are nutrients, other habitat alterations, and siltation; the probable source of impairment is silviculture. Waterbodies listed as water-quality limited are prioritized by the DEQ for development of a TMDL. Swift creek is listed as a low priority for TMDL development, and is not one of the top 10 waterbodies proposed for TMDL development. Until a TMDL is developed for Swift Creek, 75-5-702, MCA (Montana TMDL Law), states that new or expanded activities that may further the listed impairment may commence and continue provided they are conducted using all reasonable land, soil, and water conservation practices (commonly called BMPs).

WATER QUALITY AND SEDIMENTATION

As stated in Chapter I, concerns were expressed that:

- minimum SMZ widths may not adequately protect water quality,
- timber management within SMZs should not be ruled out,
- timber harvesting and road construction may generate sediment, and
- long-term timber management may lead to increases in timber management.

The analysis will address these concerns in Chapter III and IV.

Timber harvesting and related activities, such as road construction, can lead to water-quality impacts by increasing the production and delivery of fine sediment to streams. Construction of roads, skid trails, and landings can generate and transfer substantial amounts of sediment through the removal of vegetation and the exposure of bare soil. In addition, removal of vegetation near stream channels reduces the sediment filtering capacity and may reduce channel stability and the amounts of large woody material. Large woody debris, which creates natural sediment traps and energy dissipaters to reduce the velocity and erosiveness of stream flows, is a very important component of stream dynamics.

Analysis Methods

The existing impacts to water quality in the project area were analyzed primarily through a detailed sediment-source inventory. Stream channels in the project area were examined to determine any point sources of sediment. Examples of in-channel sources of sediment would include downcutting of the channel bed, gully formation, or streambank erosion. In addition, a detailed sediment-source inventory of the existing road system was conducted to determine both point and nonpoint sources of sediment. Problems were cataloged for repair.

Analysis Area

The analysis area for water quality consists of the project area, including first and second-order watersheds, and 5 miles of the Lower Whitefish road system leading in and out of the project area *(see Figure III-14)*.

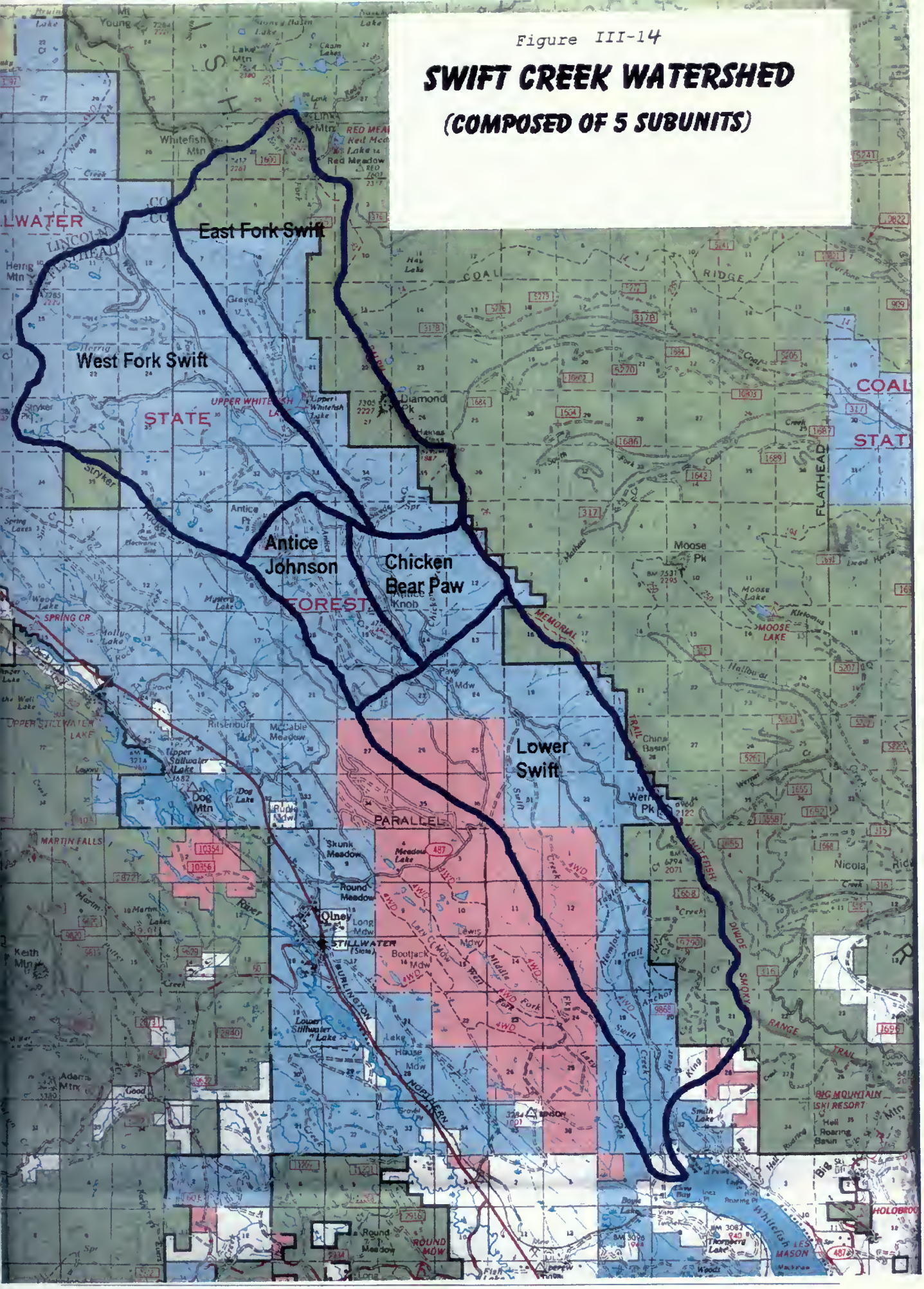
Results

Each of the creek channels in the proposed project area was assessed to determine stability and in-channel sources of sediment. Channel stability was found to be good in most reaches. Stream channels located on the steep slopes above Lower Whitefish Road are high gradient with large boulders and good levels of large woody material. These reaches have good channel stability and have no evidence of

Figure III-14

SWIFT CREEK WATERSHED

(COMPOSED OF 5 SUBUNITS)



in-channel sources of sediment. The second-order stream has one reach in Section 30 where there is a deposition of gravel. This deposition occurs at a point where the stream grade flattens; no further evidence of sediment deposition was found downstream from this point. The creek had some downcutting approximately 200 feet upstream that may have been caused by the failure of an old log or debris jam, but no other potential source of sediment was identified upstream from the deposition. All other reaches surveyed were found to be healthy with adequate bank vegetation and a stable bed and banks.

All roads within and leading to the proposed project area were surveyed to identify existing or potential sources of sediment. The road to Werner Peak Lookout was found to have severe surface drainage problems. Road grades approach 18% in places and, generally, are not less than 8%. Surface drainage features were, essentially, absent from this road system, with erosion and gullying occurring in several places. There were several stream-crossing structures identified that are not large enough to carry a 50-year flood event, and several places where ditch relief culverts are either not functioning or absent. The road system that runs through Section 30 was also surveyed. Surface drainage structures have been installed in this road, but most of them are not built to proper specifications and function marginally. All crossing structures are adequately designed on this road system. Lower Whitefish Road was surveyed for sources of sedimentation. This road was reconstructed with the Werner/Taylor Timber Sale in 1994 and 1995 and is designed to meet all current BMPs. Most of the stream-crossing structures were replaced when the road was reconstructed. Two stream crossings were not replaced with the Werner/Taylor Timber Sale project. One is located in Section 19 of the project area, and the other is located approximately 1/2-mile north of the project area on Upper Whitefish Road. In both cases, the existing culverts are not large enough to withstand a 50-year flood event, and runoff from the road surface is directed to the stream. No other problems were found on Lower Whitefish Road.

CUMULATIVE WATERSHED EFFECTS OF PAST ACTIVITIES

Cumulative watershed impacts are defined as impacts to water quality that may result from the proposed action when combined with other past and present actions. Individually, these actions may not adversely affect water quality, but present a higher risk of adverse impacts when combined. Timber harvesting and associated activities can affect the timing, distribution, and amount of water yield in a harvested watershed. Water yields increase proportionately to the percentage of canopy removal, because the removal of live trees reduces the amount of water transpired, leaving more water available for soil saturation and runoff. Canopy removal also decreases interception of rain and snow and alters snowpack distribution and snowmelt, which lead to further water yield increases. Higher water yields may lead to increases in peak flows and peak-flow duration, which result in accelerated streambank erosion and sediment deposition.

Analysis Methods

The cumulative effects of past activities in the Chicken/Werner Timber Sale Project area and Swift Creek watershed were determined using the PC version of the R1WATSED model developed by Region 1 of the USFS. WATSED estimates the increase in water yield caused by removal of live trees using the Equivalent Clearcut Area (ECA) method. ECA is a function of total area roaded and

harvested, the percent of crown removal in harvest, and the amount of vegetative recovery that has occurred in harvest areas. This method equates the area harvested and the percent of crown removed with an equivalent amount of clearcut area. For example, if 100 acres had 60% of crown removed, ECA would be approximately 60, or equivalent to a 60-acre clearcut. The relationship between crown removal and ECA is not a 1-to-1 ratio, so the ECA percent is not always the same as the percent of canopy removal. As live trees are removed, the water they would have evaporated and transpired either saturates the soil or is translated to runoff. This method also calculates the recovery of these increases as new trees vegetate the site and move toward preharvest water use. WATSED also estimates sediment production from road and timber-harvesting activities. Estimates of sediment production by activities are expressed as a percentage above an estimated "natural" baseline condition generated by the model based on soil types and watershed size. Since the natural conditions are calculated on the basis of empirical formulas and not on site-specific measured data, sediment values generated by the model are only valid as a comparison between alternatives and should not be interpreted as absolute values.

In order to effectively evaluate the potential cumulative effects of past activities, a threshold of concern must be established for the Lower Swift Creek watershed. The stability of a stream channel is the best indicator of where a threshold of concern should be set. As water yields increase as a result of canopy removal, the amount of water flowing in a creek gradually increases. When these increases reach a certain level, the bed and banks may begin to erode. More stable streams will be able to handle larger increases in water yield before they begin to erode, while less stable streams will experience erosion at more moderate water-yield increases. The channel stability of the streams in and around the project area were evaluated using qualitative assessments, as well as using procedures outlined in Forest Hydrology Part II *(Haupt, et. al.)*.

Analysis Area

The primary analysis area used for the cumulative effects of past activities on the watershed resource is the Lower Swift Creek watershed. This watershed, approximately 17,199 acres, consists primarily of the main stem of Swift Creek and numerous first- and second-order tributaries to the main stem *(see Figure III-14)*. This analysis area, the most appropriate for assessing the existing status of Swift Creek near the project area, will provide a good baseline for comparison of any proposed activities. The entire Swift Creek watershed was also assessed to determine if any of its 5 subwatersheds were at or above a threshold of concern. A qualitative assessment of the first- and second-order watersheds in the proposed project area was also considered.

Results

Channel stability in the Lower Swift Creek watershed is generally poor. This assessment is primarily based on the large mass failures occurring along the lower reaches of the main stem of Swift Creek. These failures are a natural occurrence as Swift Creek cuts through deep, unconsolidated glacial till in order to form a wider flood plain. Portions of the main stem of Swift Creek located away from these slope failures are in fair to good condition, with good levels of bank vegetation and large woody debris. Since Swift Creek is listed as a water-quality-limited waterbody, in need of TMDL development (303(d) list), the SFLMP states that watersheds in Stillwater State Forest will be managed at a low risk for watershed cumulative effects.

Because of the destabilizing influence of the mass failures, the recommended threshold of concern is 8% for the Lower Swift Creek watershed. This level is very conservative and usually is implemented only on the most unstable streams.

According to WATSED, the current annual water yield increase in the Lower Swift Creek watershed is 4% over natural, and the peak flow increase is 5% over natural. Past harvesting and road building has generated 2,274 ECA. The recommended ECA level associated with an 8% water yield increase threshold is 3,440. *Table III-12* summarizes the cumulative effects of past activities on water yield in the Lower Swift Creek watershed. Each of the 5 subwatersheds in the Swift Creek watershed (East Fork Swift, West Fork Swift, Chicken/Bear Paw, Antice/Johnson, and Lower Swift) were also analyzed with WATSED to determine if any individual subdrainage was above the recommended threshold of concern; none were. A weighted average of the subwatersheds showed that the entire Swift Creek watershed is currently at 5.6% water yield increase above natural *(refer to Figure III-14)*.

The first- and second-order streams within the project area were evaluated and found to have good channel stability. Past harvesting in these watersheds has been very limited; far less than 20% of the watershed is in a harvested condition. In order to reach the 8% threshold in these drainages, 20% of the watershed would need to be in ECA, so these watersheds are well below the recommended limit.

TABLE III-12 - CUMULATIVE EFFECTS OF PAST ACTIVITIES PREDICTED BY WATSED

EFFECTS OF PAST ACTIVITIES	LOWER SWIFT CREEK SUBUNIT	SWIFT CREEK WATERSHED
Cumulative acres harvested[1]	3,703	12,216
Existing ECA[2]	2,274	7,175
Allowable ECA	3,440	9,867
% Water yield increase over natural[3]	4%	5.6%
Allowable water yield increase (%)	8%	8%

[1] Includes all past harvesting, whether revegetated or not
[2] All values are based on projection year 2000
[3] The natural condition was determined by WATSED using empirical formulas and are not based on measured values on the ground. Use values only as a comparison to other alternatives.

FISHERIES

MONITORING OF FISH HABITAT AND POPULATIONS

Westslope cutthroat trout and bull trout are species of special concern in Montana; they are found in limited numbers and habitats in Montana. The bull trout was listed as a threatened species under the Federal Endangered Species Act in 1998. DFWP manages the Stillwater River drainage, including Swift Creek, for the native westslope cutthroat trout and bull trout.

Analysis Methods

In order to meet the recommendations for these species from the Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program (the cooperative study report) (Flathead Basin Commission, 1991), DNRC has contracted DFWP and arranged for the collection efforts required to develop index values of existing habitat quality. The DNRC/ DFWP strategy is to first develop the index of juvenile bull trout rearing-habitat quality using substrate scoring and McNeil coring, as described in the cooperative study report. Based on the results from substrate scoring, DNRC, in consultation with DFWP, will decide if additional monitoring is necessary. The monitoring consists of first surveying for species composition to determine the presence of bull trout or migratory westslope cutthroat trout. If either species is found, spawning surveys, McNeil coring, and substrate scoring will be conducted.

The Flathead Basin Forest Practice Study showed a direct link between on-the-ground activity *(Sequoia Index)* and habitat quality *(McNeil coring)*. The study showed an even stronger tie between spawning-habitat quality (percent fines) and embryo survival to emergence. The cooperative recommended caution when the amount of fine material (percentage less than 6.35 mm), as indicated by McNeil coring, exceeded 35 percent. Recommendations call for a red flag at levels above 40 percent.

Analysis Area

The analysis area for this proposal consists of the perennial tributaries to Swift Creek found in the proposed project area and the main stem of Swift Creek downstream from the project area.

Results

The perennial tributaries to Swift Creek and the main stem of Swift Creek were sampled by Tom Weaver from DFWP in 1997 and 1998 to determine whether bull trout or westslope cutthroat trout inhabit these streams. No bull trout or westslope cutthroat trout were found in either of the perennial tributaries to Swift Creek. Through a snorkel survey of the main stem of Swift Creek, both bull trout and westslope cutthroat trout were found to inhabit the main stem. The area has not yet been surveyed for spawning activity. The amount of stream to be surveyed is extensive and will likely be conducted by aerial flight in the fall of 1999. Until spawning sites are identified, McNeil coring and substrate scoring cannot be completed.

CUMULATIVE EFFECTS OF PAST ACTIVITIES TO BULL TROUT AND WESTSLOPE CUTTHROAT TROUT

Cumulative effects are defined as impacts that may result from the proposed action when combined with other past and present actions. Individually, these actions may not adversely affect bull trout habitat or populations, but when combined, present a higher risk of adverse impacts. Among other things, activities which have the potential to affect bull trout habitat and populations include road construction, especially where it is nearby or crossing a creek, and

removal of live trees, which can lead to increased runoff and associated erosion of streambed and streambanks.

Analysis Methods

Procedures used to evaluate the cumulative effects of past activities to bull trout and westslope cutthroat trout are primarily the same as those used to assess the effects of past management.

Analysis Area

The analysis area used to assess the cumulative impacts of past activities to bull trout and westslope cutthroat trout will consist of the Lower Swift Creek watershed and all tributaries located within the proposed project area.

Results

Although there are numerous other factors leading to the decline of bull trout populations, such as management of other aquatic species and fishing regulations in Swift Creek, Whitefish Lake, Whitefish River, Stillwater River, Flathead Lake, and Flathead River, these are all managed by DFWP and are not under the control of DNRC. Water-quality impacts can also impact the populations of fish species such as bull trout by modifying spawning and rearing habitat.

Past timber harvesting has occurred within the proposed project area and Lower Swift Creek watershed since the 1950s. Activities involved the construction of roads within the Lower Swift Creek watershed, including Lower Whitefish Lake and Werner Peak Lookout roads, which are located within the proposed project area. Road conditions and cumulative watershed effects of past activities are found in the watershed portion of this document. As stated, the existing road system has existing and potential sources of fine sediment that can affect downstream spawning and rearing habitat. Only one small in-channel source of sediment was identified within the project area. Numerous in-channel sources of sediment were identified on the main stem of Swift Creek; these are described in more detail in the watershed portion of the document. The degree to which past management activities have affected fisheries populations is unknown since past monitoring did not result in any conclusions. Current water-yield increases in the Lower Swift Creek and entire Swift Creek watersheds are currently well within recommended thresholds of concern.

SOILS

Soil types in the proposed project area are composed mainly of deep glacial till in the lower portions of the Swift Creek valley, and steep residual soils on mid and upper slopes of the Whitefish Range. Geology of the soils in the project area is residual soils weathered from bedrock, with glacial till in the lower elevations. Parent material of the residual soil is argillite, siltite, and limestone from the Belt Supergroup. A brief description and management interpretations for the soil types found in the project area are listed in *Table III-13 and mapped in Figure III-15*. These interpretations were taken from the FNF Land System Inventory.

CUMULATIVE EFFECTS OF PAST ACTIVITIES TO SOIL PRODUCTIVITY

Cumulative effects to soil productivity are those impacts to soils that individually may not adversely affect the soil resource, but when combined through repeated entries may present impacts to productivity. Cumulative effects to soils are generally caused by repeated entries into the same stands.

Methods

The cumulative effects of past activities to soil productivity were analyzed through a field inspection of the project area. Particular attention was given to old harvest units completed under past management. Maps of old sale areas and aerial photography were used to locate past harvest units; the condition of the soil resource was determined through field visits. Skid trail density was approximated to determine the percent of the area impacted.

Analysis Area

The area within the boundaries of the proposed project area was the analysis area used to determine the cumulative effects of past management on soil productivity. Impacts of past management to soils located outside of the proposed project area would not be affected by the current proposal. Refer to *TABLE III-13* for management interpretations of the soil types found in the project area.

Results

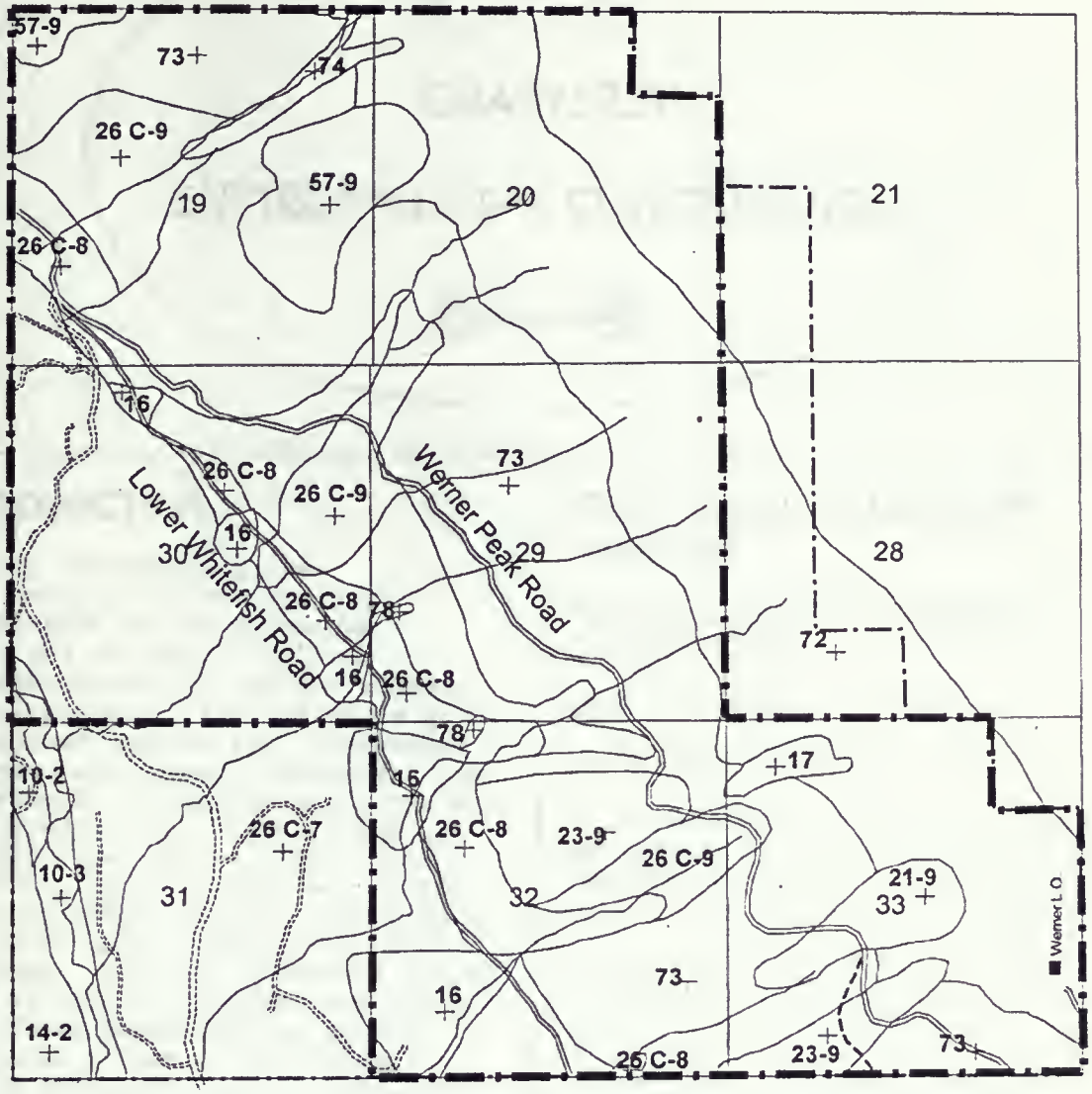
Timber harvesting in the proposed project area began in the 1950s. These entries consisted of overstory removals using ground-based machinery. Skid trails were spaced at approximately 200-foot intervals, and, in some cases, were excavated into the hill. These trails are revegetating well and are not actively eroding. Most of the trails now have trees growing in them and a fully mature forest canopy over them. In the mid-1970s, the Lower Werner Timber Sale occurred near the intersection of Werner Peak Lookout Road and Lower Whitefish Lake Road; the Lower Werner Salvage and Werner Taylor Timber Sale were completed in the mid to late 1980s. In harvest units where ground-based machinery was used, no more than 20% of the harvest unit appears to be trafficked by skid trails. These levels of soil disturbance are within the accepted range where cumulative impacts to soil productivity are not a problem.

TABLE III-13 CHICKEN/WERNER AREA SOIL DESCRIPTIONS AND LIMITATIONS

MAP UNIT	DESCRIPTION	SOIL DRAINAGE	TOPSOIL DISPLACEMENT AND COMPACTION	SEEDLING ESTABLISHMENT	EROSION (BARE SURFACE)	NOTES
10-3	Alluvial soils	Poor to well drained	Severe	Good	Low	Streamside-management guides will be applied.
16	Alluvial fans	Well drained	Moderate	Fair	Slight	Deep gravel and shallow surface soils. Beargrass competition common. Avoid displacement.
21-9	Cinque Basin glacial till and residual soils on 40-60% slopes	Somewhat excessive	Moderate/high	Fair, droughty	Moderate to high	Moderate deep coarse soils reduce water and nutrients; south slopes very droughty; cable-yard slopes over 45%, or use soft-track on up to 55% slopes.
26C-7	Deep glacial till on 0-20% slopes	Well drained	Moderate (severe if wet)	Good	Low	Deep, productive soil. Topsoil depth is very important.
26C-8	Deep, silty glacial till on 20-40% slopes	Well drained	Moderate (severe if wet)	Good	Moderate	Deep, productive soil. Topsoil depth is very important.
26C-9	Deep, silty glacial till on 40-60% slopes	Well drained	Moderate to high	Good	Moderate to high	Deep, productive soil, average season of use. Limit soft-track skid-der to slopes less than 45%.
57-9	Residual soils and moderate deep glacial till 20-40%	Well drained	Severe displacement	Fair to Good Dry on south slopes	Moderate	Steep slopes limit tractor operation. Use cable or helicopter yarding system.
72	Alpine ridge headwalls slopes 60%+	Excessive	High displacement	Harsh site: poor.	Moderate	Low productivity: few trees.
73	Trough wall glacial till and rocky, residual soil on 60% + slopes	Fair to good Droughty on south slopes	High displacement	Fair	Moderate to high	Steep slopes require cable operation.
23-9	Residual soils and high glacial till on 40-60% slopes	Well drained	Moderate	Fair to good	Low to moderate	Steep slopes severely limit equipment operation.
78	Residual soils and glacial till	Well drained	Severe	Droughty on south slopes	Low to moderate	Moderate to extremely steep slopes limit equipment use
17	Stratified silt, sand, pebbles, and cobbles.	Well drained	N/A	Poor	Low to moderate	Severe steep slope: frequent avalanche area.
74	Stream breaklands, slopes over 60%	Fair to good droughty on south slopes	High displacement	Fair, competition	High	Steep slopes require cable operation. Not well suited for road building: requires site-specific review.

Map of Soil Units

FIGURE III-15



LEGEND

- Open Roads
- Gated Roads
- Proposed Temporary Road
- Project Area Boudary
- Soil Type Boundary

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CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

Chapter IV describes the environmental effects of each alternative on the resources described in Chapter III and provides the basis for the Summary Of Environmental Effects Table at the end of Chapter II. Cumulative effects from current management and foreseeable future State actions are discussed in this chapter. These include other active timber sale projects, projects that are in the planning stage, ongoing maintenance, and other uses of the areas being analyzed. Refer to Chapter I for a list of recent, ongoing, and future activities identified as having potential effect on the Chicken/ Werner analysis. Direct, indirect, and cumulative effects on the resources being analyzed were considered. An economic analysis is also presented. Appendix A lists proposed mitigation measures specific to all action alternatives.

VEGETATION (LANDSCAPE ANALYSIS)

AGE-CLASS AND COVER-TYPE DISTRIBUTION

Direct and Indirect Effects

No-Action Alternative A

If Alternative A were chosen and no management activities occur for this project entry, the following natural processes would likely take place:

- The age-class distribution in the project area would remain the same for the short term.
- Over time, lacking substantial disturbances, such as timber harvesting or wildfire, the proportion of seedling/sapling-sized stands would gradually decrease.
- In the short term, stocking levels would generally increase.
- In the short term, insect and disease levels would remain the same or increase due to the condition of the stands in the project area. Insect infestations and diseases would likely spread to healthy trees as host trees die out.

- As shade-tolerant species continue to grow under existing canopies, the mixed-conifer cover type will increase and the western larch/ Douglas-fir cover type will decrease.

Action Alternatives B, C, D, and E

Chapter II described the development of Alternatives B, C, D, and E, as well as the similarities and differences between them. The proposed harvest and reforestation methods differ between units, but not between the alternatives. Due to the fact that certain harvest units are not included in specific alternatives, the effect on acres of age classes and cover types is variable.

As shown in Chapter III, the mixed-conifer and subalpine fir cover types are presently overrepresented on Stillwater State Forest in reference to appropriate conditions. The proposed harvest alternatives would convert some existing cover types not representative of those that appropriately occupy these sites. In the process of altering the existing cover types, there will be changes to age-class distribution across the project area.

Table IV-1 shows the number of acres that would be converted to a different cover type and/or age class under the proposed harvest prescription for each of the 4 action alternatives.

TABLE IV-1 – EFFECTS TO AGE-CLASS DISTRIBUTION AND COVER TYPE BY UNIT (Shows the projected changes to age class and cover types in harvest units following the proposed silvicultural treatments). Average net volume per acre for current and residual stands are approximations based on SLI data and on-the-ground verification.

UNIT #	TOTAL ACRES	ACTION ALTERNATIVE	CHANGES IN AGE CLASS	CHANGES IN COVER TYPE
1	83	B, C, D, and E	All 83 acres of Unit 1 fall into the 100-to-149-year age class. The residual stand of older seral species would be classified as the same age stand.	The current cover type for 54.1 acres of the unit is subalpine fir. The remaining 28.5 acres is classified as a mixed-conifer cover type. Following the proposed harvest, both cover types would be converted to an appropriate western larch/Douglas-fir cover type through the removal of 4-6 MBF per acre; currently there are approximately 14 MBF per acre.
2	68	B, C, D, and E	Approximately 26.2 acres of the harvest area is currently in the 100-to-149-year age class. The remaining 42 acres are 150+ years old. Based on the prescription to leave a scattered canopy of older seral species, the postharvest age would be 100 to 149 years.	SLI classified the south end of Unit 2 (26.2 acres) as an existing lodgepole pine cover type with an appropriate cover type of western larch/Douglas-fir; all are expected to convert to the appropriate western larch/Douglas-fir cover type. SLI classified the current and appropriate cover type of the remaining 42 acres as subalpine fir; these are expected to convert from subalpine fir to western larch/Douglas-fir through the removal of approximately 4.5 MBF per acre; currently there are approximately 11 MBF per acre.
3	46	B, C, D, and E	Due to a diverse mix of species and age classes, the current stand age (100 to 149 years) would remain the same - 22.5 acres of the 100-to-149-year age class would remain the same, and 23 acres of old growth would convert to the 100-to-149-year age class.	The eastern half of Unit 3 is currently classified as 22.5 acres of the subalpine fir cover type, with western larch/Douglas-fir listed as the appropriate cover type. All 22.5 acres are expected to convert to the appropriate larch/Douglas-fir cover type following treatment. The remaining 23.4 acres of Unit 3 was inventoried as both current and appropriate mixed-conifer cover types. No expected change in cover type is expected; however, a higher ratio of seral species would replace the grand fir concentrations on these 23.4 acres, and the white pine cover type may be assigned to the residual stand through the removal of approximately 4 MBF per acre; currently there are 5 to 11 MBF per acre.
4	35	B, C, D, and E	Most of the 150+-year age class would shift to a 0-to-39-year age class following treatment.	SLI classifies Unit 4 as both a current and appropriate mixed-conifer cover type. Following treatment and planting, all 35 acres would likely convert to the western white pine cover type classification. The current volume is approximately 12 MBF per acre; approximately 8.6 MBF per acre would be removed.

UNIT #	TOTAL ACRES	ACTION ALTERNATIVE	CHANGES IN AGE CLASS	CHANGES IN COVER TYPE
5	53	B, C, D, and E	Approximately 19.1 acres of Unit 5 falls into the 100-year age class; the remaining 33.8 acres are 150 years old. The stand age will be in the 100-to-149-year age class following harvest.	The west side of Unit 5 (24.9 acres) is classified as a current and appropriate mixed-conifer cover type. The eastern portion (28 acres) of Unit 5 is classified as both a current and an appropriate western white pine cover type. The proposed harvest on both sides of Unit 5, would focus on thinning to improve overall growth rates in healthy seral species; no conversion of cover type is expected with the removal of approximately 4 MBF per acre. Currently there are 9 to 13 MBF per acre.
6	33	B and D	The older Douglas-fir would be retained and the present 100-to-149-year age class would not change.	Currently, Unit 6 contains 14 acres of a mixed-conifer cover type and 19 acres of a lodgepole pine cover type. The appropriate Losensky cover type for the present mixed-conifer cover type is western white pine, and the appropriate cover type for the lodgepole pine cover type is a western larch/Douglas-fir cover type. All 33 acres are expected to convert to their appropriate cover type with the removal of approximately 5.5 MBF per acre. Currently there are 9 to 11 MBF per acre.
7	18	B and D	The present 150+-year age class would remain the same for 12 acres; 6 acres would be planted and the new age class would be 0 to 39 years.	The current subalpine fir cover type would be converted to an appropriate western white pine cover type. Douglas-fir and larch would be retained in the overstory. The current volume is approximately 11 MBF per acre and approximately 5.6 MBF per acre would be harvested.
8	23	B and D	Most of Unit 8 is in the 100-year age class; 15 acres would be converted to a 0-to-39-year age class.	Unit 8 is currently classified as a subalpine fir cover type. The stand would be converted to the appropriate lodgepole pine cover type through the removal of 3 MBF per acre; currently there is 6 MBF per acre.
9	35	B and D	The harvest would focus on younger-aged shade-tolerant species, therefore, the stand age (150+ years) would remain the same postharvest.	The current and appropriate cover type is listed as subalpine fir. Harvesting would convert approximately 30 acres of the subalpine fir cover type to a western larch/Douglas-fir cover type, which appears to have done well here in the past. The current volume is approximately 10 MBF per acre and 4 to 5 MBF per acre would be removed.

UNIT #	TOTAL ACRES	ACTION ALTERNATIVE	CHANGES IN AGE CLASS	CHANGES IN COVER TYPE
10	129	B, C, D, and E	Approximately 80 acres of old growth (150+ years) would not change. Approximately 10 acres of the 100-to-149-year age class and 25 acres of the 150+-year age class would convert to a 0-to-39-year age class. 13.8 acres would remain in the 40-to-99-year age class. In general, where the residual older seral species are retained, the average stand age would remain the same. Approximately 35 acres of group-select openings would convert to a 0-to-39-year age class.	Portions of 6 individual stands make up Unit 10. There are 28.2 acres of current and appropriate mixed conifer cover type. This portion of the stand would remain in that cover-type classification because of the current species mix. Currently and appropriately classified as a western white pine cover type are 76.6 acres of the stand, which would likely remain the same due to a high ratio of healthy western white pines in the existing unit. There are currently 11 acres of the mixed-conifer cover type that would convert to the appropriate western white pine cover type where healthy western white pine seedtrees are retained during logging. The remaining 13.8 acres, currently classified as a subalpine fir cover type, will be converted to a western larch/Douglas-fir appropriate cover type. The current volume is approximately 11 MBF per acre and 3 to 4 MBF per acre would be removed.
11	52	B, C, D, and E	Approximately 24 acres would maintain a stand age of 150+ years. Approximately 28 acres of the 150+-year age class would convert to the o-to-39-year age class with a group-select harvest.	Seven acres would be converted from a mixed-conifer cover type to an appropriate western larch/Douglas-fir stand. The remaining 44.8 acres is both currently and appropriately a western white pine cover type. Healthy Douglas-fir, western white pine, and western larch would be favored to convert Unit 11 to a mix of appropriate seral species and maintain the western white pine cover type. The current volume is approximately 12 MBF per acre; approximately 6 MBF per acre would be re-
12	62	B, C, D, and E	The average age of Unit 12 is 150+ years. Approximately 50 acres would be converted to a 0-to-39-year age class. The remaining 12 acres would maintain a stand age of 150+ years.	The entire unit would convert from a mixed-conifer cover type to an appropriate western larch/Douglas-fir cover type through the removal of approximately 4.6 MBF per acre. The current volume is approximately 11 MBF per acre.
13	34	B, C, D, and E	The average SLI age is 150+ years; 11 acres would maintain the same age class. Approximately 75% of the stand (23 acres of older grand fir) would be removed and replaced with a 0-to-39-year age class of seral species.	The entire unit is both currently and appropriately classified as a western white pine cover type. Existing western white pine will be retained; western white pine and western larch will be planted. No change in cover type is expected. The current volume is approximately 7 MBF per acre; approximately 5.6 MBF per acre would be removed.

UNIT #	TOTAL ACRES	ACTION ALTERNATIVE	CHANGES IN AGE CLASS	CHANGES IN COVER TYPE
14	56	B, C, D, and E	Approximately 29 acres of Unit 14 are in the 40-to-99-year age class; 10.5 acres are in the 100-to-149-year age class and would remain that age with the removal of the younger shade-tolerant species. Overlapping into this unit is 6.4 acres of the 150+-year-old stand from Unit 13; this will remain in the 150+-year age class.	There are 39.4 acres with a current and appropriate western white pine cover type. This cover type would remain the same. Another 16.6 acres are currently in a mixed-conifer cover type and will be converted to an appropriate western larch cover type. The current volume is approximately 10 MBF per acre; approximately 5 MBF per acre would be removed.
15	30	B and D	All 30 acres of the 150+-year age class would remain an old growth stand with the removal of less desirable shade-tolerant trees and the retention of many older trees.	The unit is currently classified as a mixed-conifer cover type and is listed as an appropriate western larch/Douglas-fir cover type. The postharvest condition of the stand is expected to convert 30 acres to a larch and Douglas-fir cover type through the removal of approximately 4.5 MBF per acre. The current volume is approximately 13 MBF per acre.
16	40	B, C, D, and E	In order to thin out high-risk trees and regenerate some seral species, the current 150+-year age class would revert back to a younger stand (100 to 149 years.	The current and appropriate cover type is western white pine; no conversion is expected through the removal of approximately 4 MBF per acre. The current volume is approximately 10 MBF per acre.
17	34	B, C, D, and E	The current stand age is 150 years and the postharvest stand age is expected to be 150+ years, as only a well-stocked overstory of the oldest trees would be retained.	All 34 acres are classified as a current mixed conifer and appropriate western larch/Douglas-fir cover type; therefore, the cover type is expected to convert to a western larch/Douglas-fir where this cover type is retained during harvest. The current volume is approximately 6 to 8 MBF per acre and 2 to 5 MBF per acre would be removed.

UNIT #	TOTAL ACRES	ACTION ALTERNATIVE	CHANGES IN AGE CLASS	CHANGES IN COVER TYPE
18	115	B and C	Approximately 91 acres of Unit 18 has an average age of 150 years old. The age of the remaining 24 acres is 100 to 149 years. There would be no change in age classes since many of the older trees would be retained.	Currently, 84.7 acres are a mixed- conifer cover type. The appropriate cover assignment of western larch/Douglas-fir is assigned to 60.7 of those acres, which would be converted to a western larch/ Douglas-fir cover type. The remaining 24 acres are an appropriate mixed-conifer cover type, and the removal of intermediate canopy species would convert the stand to a western larch/Douglas-fir cover type. Another 6.2 acres are listed as both current and appropriate western white pine cover types, so there would be no change in cover type. There are 23.6 acres listed as a current and appropriate western larch/Douglas-fir cover type. No cover type conversion is expected . The current volume is approximately 13 MBF per acre and 5 to 6 MBF per acre would be removed.
19	88	B and C	The 88 acres would remain 150+ years following a harvest treatment that retains the older trees.	Unit 19 is similar to Unit 18; the same treatment will be applied. Western larch/Douglas-fir is the appropriate cover type. Approximately 65.2 acres is currently classified as a mixed-conifer cover type; another 19.6 acres is classified as a western larch/Douglas-fir cover type. The proposed treatment would convert the mixed conifer to an appropriate western larch/Douglas-fir cover type. The current volume is approximately 17 MBF per acre and 4 to 5 MBF per acre would be removed.
20	58	B	With the retention of older trees in Unit 20, 50 acres would remain in the 150+-year age class; the remaining 8 acres would still be in the 100-to-149-year age class.	The appropriate cover type is western larch/Douglas-fir, with the exception of 8 acres of a western white pine appropriate cover type. Currently, approximately 45.3 acres are cover typed as mixed conifer, and 8 acres as western white pine. In both areas, the western white pine cover type will remain the same, and, with the removal of shade-tolerant species, the mixed-conifer type will be converted to a western larch/Douglas-fir cover type. The current 5.1 acres of western larch/Douglas-fir cover type would not change. The current volume is approximately 16 MBF per acre; approximately 5.6 MBF per acre would be removed.
21	84	B	Unit 21 is described in the SLI data as a 150+-year-old stand. Approximately 50% (45 acres) of the stand would convert to a 0-to-39- year age class. The rest would remain the same.	The current mixed-conifer cover type is classified as an appropriate western larch/Douglas-fir type; 74 acres of the stand would be converted to a western larch/Douglas-fir cover type, and the remaining 8 acres would not change from a western white pine cover type. The current volume is approximately 15.5 MBF per acre; approximately 5.5 MBF per acre would be removed.

UNIT	TOTAL	ACTION	CHANGES IN	CHANGES IN
22	50	B and D	The current 100-to-149-year age class would remain the same for 20 acres, where many of the older trees would be retained in the overstory. Approximately 30 acres of the stand would be converted to a 0-to-39-year age class in the newly created openings following	The area in Unit 22 is currently classified as a mixed-conifer cover type and, following harvest, would be converted to an appropriate western larch/Douglas-fir cover type. The current volume is 7 to 9 MBF per acre; 2 to 3 MBF per acre would be removed.
23	36	B and D	Approximately 60% of Unit 23 (21.6 acres) would be converted from a 100-to-149-year age class to a 0-to-39-year age class, with a conversion to the appropriate cover type. Another 10.8 acres, where older trees are retained, would be assigned the same age class of 100 to 149 years.	According to SLI data, all 36 acres of Unit 23 are appropriately cover typed as western larch/Douglas-fir. Currently, 19 acres are a mixed-conifer cover type and 16.7 acres are a subalpine fir cover type. All 36 acres would be converted to the appropriate western larch/Douglas-fir cover type. The current volume is approximately 4 MBF per acre; 1.5 MBF per acre would be removed.

The actual acres affected by the age-class and cover-type conversions, found in *Table IV-1* above, are summarized in the *Tables IV-2 and IV-3*.

DNRC's management objectives are to increase the amount of old-growth western larch/Douglas-fir stands. A way this may be achieved is through harvest practices that retain the existing large-diameter western larch and Douglas-fir, while retaining a high to moderately high level of old-growth attributes. In some mixed-conifer and subalpine fir stands, there are very few older seral species to leave; portions of these stands would revert to the youngest age class following a regeneration-type harvest.

In the 4 action alternatives, the amount of old-growth stands would decrease by approximately 322 to 367 acres, depending on the alternative. Some of these acres would shift to a slightly younger age class (100 to 149) with the removal of shade-tolerant and high-risk/diseased trees. Many of these conversions would be direct results of implementing the harvest prescription. Removing shade-tolerant species (Engelmann spruce, grand fir, and subalpine fir) from a well-distributed western larch/Douglas-fir stand would immediately convert that stand from a mixed-conifer cover type to a western larch/Douglas-fir cover type. An indirect effect of harvesting might take place where the stand conversion was not immediate. In this instance, the removal of shade-tolerant species from a stand that has only very scattered mature larch or western white pine would result in an open stand that requires planting or several years to regenerate before a new cover type may be assigned.

TABLE IV-2 - EFFECTS OF EACH ACTION ALTERNATIVE ON ACRES OF AGE-CLASS DISTRIBUTION POSTHARVEST FOR THE CHICKEN/WERNER PROJECT AREA

ALTERNATIVES	ACRES OF NONSTOCKED/ SEEDLING/ SAPLING 0-39 YEARS	ACRES OF POLES 40-99 YEARS	ACRES OF MATURE 100-149 YEARS	ACRES OF OLD GROWTH 150+ YEARS	TOTAL FORESTED ACRES IN THE PROJECT AREA
Alternative A (No Action)	66.3	867.8	844.9	1,939.5	3,718.4
Alternative B	396.0	867.8	882.1	1,572.5	3,718.4
Alternative C	339.4	867.8	933.7	1,577.5	3,718.4
Alternative D	351.0	867.8	882.1	1,617.5	3,718.4
Alternative E	339.4	867.8	933.7	1,577.5	3,718.4

TABLE IV-3 - ACRES CONVERTED TO A DIFFERENT COVER TYPE IN EACH ALTERNATIVE

PROPOSED ACTION ALTERNATIVE	EXISTING COVER TYPE	ACRES CONVERTED TO A WESTERN LARCH/ DOUGLAS-FIR COVER TYPE	ACRES CONVERTED TO A WESTERN WHITE PINE COVER TYPE	ACRES CONVERTED TO A LODGEPOLE PINE COVER TYPE
Alternative B	Subalpine fir	183	18	
	Mixed conifer	532	69	23
	Lodgepole pine	45		
	Acreage converted by Alternative B	*760*	*87*	*23*
Alternative C	Subalpine fir	132		
	Mixed conifer	298		
	Lodgepole pine	45		
	Acreage converted by Alternative C	*475*		
Alternative D	Subalpine fir	183	18	
	Mixed conifer	261		23
	Lodgepole pine	45		
	Acreage converted by Alternative D	*489*	*18*	*23*
Alternative E	Subalpine fir	132		
	Mixed conifer	148		
	Lodgepole pine	45		
	Acreage converted by Alternative E	*325*		

Cumulative Effects

Cumulative effects on vegetation include effects of past and current activities on all ownership within the analysis area, as well as future State actions within the analysis area, in combination with activities proposed for this project.

Past timber sales and wildfires have led to the current age class and cover type in this area. It is likely that future salvage sales and thinning projects, including those already mentioned in Chapter I, would continue to take place in the analysis area. If additional

management projects were proposed, the MEPA process would take place.

A proposed USFS proposed broadcast burn to regenerate whitebark pine would take place after 1999 just south of the project area in the NW1/4, Section 5, T32N, R22W, after 1999. This burn would alter the age class and cover type in the general vicinity of the project. No timber harvesting is likely to take place on adjacent sections of USFS land. Therefore, the age and cover type would not change due to USFS timber sales.

PCTC is managing their lands intensively; therefore, a higher number of acres in younger age classes of shade-intolerant species are likely to replace older stands. This would decrease the average age of forest stands and alter the cover types in the general vicinity of the project area.

No-Action Alternative A

- Mature stands will become increasingly multistoried as the current overstory dies and is replaced by patches of regenerated shade-tolerant species.
- Barring natural events, the frequency of disturbance would decrease in the absence of proposed management activities. Wildfire would continue to be suppressed; however, if a fire escaped initial attack, more severe burns and higher tree mortality would be expected.
- The relative abundance of shade-tolerant trees would continue to increase.

Action Alternatives B, C, D, and E

As with the No-Action Alternative, many of the same cumulative effects are applicable with the implementation of the action alternatives.

- Wildfire would continue to be suppressed and escaped fires would likely be lethal due to past suppression; however, thinning harvests often lessen the risks of large-scale fires by removing many of the ladder fuels and less fire-resistant tree species.
- Following a harvest alternative that retains older, seral tree species, stands will become increasingly multistoried as the current mature overstory dies. Unlike the No-Action Alternative, however, shade-intolerant species will take the place of shade-tolerant trees and provide replacements for older serals that die out.
- Through stand conversion and age-class manipulation, units harvested under Alternatives B, C, D, or E would regain appropriate cover types with old-growth attributes more rapidly than natural processes might allow. The resulting matrix of old-growth stands and old-growth replacement candidates would help DNRC meet its target for historical old-growth acres for the long term.

PATCH CHARACTERISTICS

Direct, Indirect, and Cumulative Effects of *No-Action Alternative A*

Patch size would not change significantly over the next 10-year period provided there are no catastrophic disturbances.

In the long term, higher proportions of older stands would result; habitat conditions and patch configuration would be affected accordingly. Patches in the Chicken/Werner Project area would, generally, become larger. The inevitable possibility of large wildfires on the Stillwater landscape could also increase average forest patch size at a later date.

The slight shift from existing condition *(Chapter III)* in patch size and shape *(see Table IV-4)* is due to an analysis that incorporates

the expected effects from the Beaver Lake Timber Sale Project. The Beaver Lake Timber Sale will sell in 1999; harvesting may take place immediately thereafter.

Direct, Indirect, and Cumulative Effects of *Action Alternatives B, C, D, And E*

The mean cover-type patch size would decrease by approximately 3 acres over all cover types on Stillwater State Forest. The median patch size would only decrease by .2 acres. The mean age-class patch size would be reduced by approximately 3.2 acres and the median patch size by 1 acre.

Within Stillwater State Forest, there is a wide variation in the size of the data samples used for some cover types in the patch analysis. When this occurs, the statistical mean is not as reliable as the median for determining the true average size of individual patches. If the median and mean are similar, it is more likely that the data range is less variable and, therefore, more reliable in determining a midrange point.

In general, it is recognized that the average patch size of timber stands has been reduced by land-management activities in comparison to historic conditions. Trying to retain natural processes by moving towards historic conditions would be one of the goals of land-management activities.

After the proposed treatments, patch shape will become slightly less irregular on Stillwater State Forest. Some degree of irregularity is desirable when trying to emulate natural disturbances; however, too much irregularity can seriously reduce amounts of core interior forest. A combination of laying out irregular unit boundaries and retaining trees in clumps along unit boundaries to create patches that better emulate natural disturbance is proposed.

The average forestwide patch size on Stillwater State Forest would likely increase in younger age classes and decrease in older age classes with our current management objective.

Intensive forest management has been practiced on PCTC's ownership for the past half century or longer; therefore, a wide range of patch sizes and shapes are found across PCTC ownership. No short-term change is expected.

Though USFS, Glacier View Ranger District, has logged extensively on the east side of the Whitefish Divide in past years, no current or future activities are planned. On the west side, USFS, Tally Lake Ranger District, is planning an 80-acre broadcast burn for 2000. This proposed burn is the only foreseen activity in the general vicinity of the project area and would likely increase area patch size to some degree.

See Tables IV-4 through IV-7 for a comparison of cumulative effects of patch size and shape for each action alternative. The following tables incorporate current inventories and known effects for completed and ongoing timber sale projects. The changes to patch size and shape include the cumulative effects to patch size and shape from completed and ongoing timber sales on Stillwater State Forest (Spring Rock, Stryker Ridge). Expected changes to patch size from the Beaver Lake Timber Sale are reflected in Alternative A.

TABLE IV-4 - MEAN and MEDIAN PATCH SIZE INDEX BY COVER TYPE ON STILLWATER STATE FOREST (SLI data of 5/18/99)

COVER TYPES	MEAN AND (MEDIAN) PATCH SIZE (ACRES)				
	ALTERNATIVE				
	A	B	C	D	E
Subalpine fir	307 (20)	296 (19)	300 (20)	296 (19)	299 (20)
Douglas-fir	29 (16)	29 (17)	29 (17)	29 (17)	29 (17)
Lodgepole pine	90 (18)	87 (17)	87 (16)	87 (17)	87 (16)
Mixed conifer	138 (27)	129 (24)	132 (25)	133 (25)	134 (26)
Nonforest	23 (13)	22 (12)	22 (12)	22 (12)	22 (12)
Ponderosa pine	31 (31)	31 (31)	31 (31)	31 (31)	31 (31)
Western larch/ Douglas-fir	125 (25)	128 (27)	126 (25)	125 (25)	125 (25)
Western white	180 (47)	176 (47)	173 (46)	173 (46)	173 (46)

TABLE IV-5 - PATCH SHAPE INDEX BY COVER TYPE (MEAN and MEDIAN) ON STILLWATER STATE FOREST

COVER TYPES	MEAN AND (MEDIAN) PATCH SHAPE				
	ALTERNATIVE				
	A	B	C	D	E
Subalpine fir	1.57 (1.36)	1.54 (1.33)	1.53 (1.33)	1.54 (1.33)	1.53 (1.33)
Douglas-fir	1.34 (1.24)	1.34 (1.24)	1.34 (1.24)	1.34 (1.24)	1.34 (1.24)
Lodgepole pine	1.53 (1.39)	1.5 (1.35)	1.51 (1.35)	1.5 (1.35)	1.5 (1.35)
Mixed conifer	1.78 (1.52)	1.75 (1.52)	1.76 (1.53)	1.75 (1.52)	1.76 (1.53)
Nonforest	1.59 (1.48)	1.55 (1.47)	1.55 (1.47)	1.55 (1.47)	1.55 (1.47)
Ponderosa pine	1.71 (1.71)	1.71 (1.71)	1.71 (1.71)	1.71 (1.71)	1.71 (1.71)
Western larch/ Douglas-fir	1.54 (1.34)	1.55 (1.36)	1.55 (1.35)	1.54 (1.35)	1.54 (1.35)
Western white pine	1.90 (1.66)	1.87 (1.64)	1.86 (1.62)	1.86 (1.62)	1.86 (1.62)

TABLE IV-6 - MEAN and MEDIAN PATCH SIZE BY AGE CLASS ON STILLWATER STATE FOREST

CURRENT AGE CLASS	MEAN AND (MEDIAN) PATCH SIZE (ACRES)				
	ALTERNATIVE				
	A	B	C	D	E
0-39 years	37 (17)	37 (17)	37 (17)	37 (17)	37 (17)
40-99 years	149 (19)	140 (18)	141 (17)	140 (18)	140 (17)
100-149 years	93 (24)	94 (23)	94 (24)	93 (23)	149 (24)
150+ years	300 (25)	273 (24)	274 (24)	270 (22)	271 (23)

TABLE IV-7 - PATCH SHAPE INDEX (MEAN and MEDIAN) BY AGE CLASS ON STILLWATER STATE FOREST					
CURRENT AGE CLASS	MEAN AND (MEDIAN) PATCH SHAPE INDEX				
	ALTERNATIVE				
	A	B	C	D	E
0-39 years	1.38 (1.26)	1.38 (1.26)	1.38 (1.26)	1.38 (1.26)	1.38 (1.26)
40-99 years	1.57 (1.42)	1.52 (1.35)	1.53 (1.36)	1.52 (1.35)	1.53 (1.36)
100-149 years	1.56 (1.38)	1.56 (1.38)	1.56 (1.40)	1.56 (1.38)	1.56 (1.40)
150+ years	1.85 (1.44)	1.77 (1.40)	1.77 (1.40)	1.76 (1.40)	1.76 (1.40)

OLD-GROWTH

Old-Growth Representation

Direct and Indirect Effects

No-Acton Alternative A

The amount, character, and distribution of existing old-growth stands would remain the same within the project area for the short term.

In the short term, fire suppression efforts would likely maintain the existing old-growth structure. Continued fire suppression would increase the hazard of stand-replacement-type fires that would consume most of the old growth.

Existing open roads would continue to provide access to firewood gatherers.

Existing cover types would change over time with natural plant succession.

Action Alternatives B, C, D, and E

The proposed harvest treatments would slightly decrease the current amount of old-growth stands (from 322 to 367 acres, depending on alternative), but not the appropriate cover-type representation in old-growth stands on Stillwater State Forest. As seen in *Table IV-2 (Age-Class Distribution)*, the number of acres in other age classes would slightly increase through harvest regimes that alter the age class of existing old-growth stands. The treatments proposed in old-growth stands would retain most of the large trees and favor the retention of western larch and Douglas-fir. With the exception of Units 18, 19, 20, and 21, all of the proposed harvest units that meet DNRC's old-growth definition have been entered previously with timber harvests.

As stated in Chapter III, Stillwater State Forest is low in the amount of old-growth stands in the western larch/Douglas-fir cover type required to meet its one-half historic minimum. The proposed harvest would improve this situation in the short term through cover-type conversions in low-attribute old-growth stands of a different cover type.

In all 4 action alternatives, the stands that would be converted from the mixed-conifer cover type to the western larch/Douglas-fir cover type would increase future options for management while meeting DNRC's commitment to biodiversity. Under the action alternatives, this proposal would convert old growth that is currently in the mixed-conifer old-growth cover type directly to a western larch/Douglas-fir old-growth stand. The prescribed treatments of Alternatives B, C, D, and E would enter these stands and remove a portion of shade-tolerant species, while retaining most of the older western larch and Douglas-fir.

DNRC has defined old growth as those

stands with a well-distributed overstory that is at least 150 years old and contain a minimum of 4 MBF of standing timber per acre. The proposed harvest treatments for Alternatives B, C, D, and E would exceed the minimum volume per acre requirement in most cases. Where stands with a higher level of old-growth characteristics are entered in Alternatives B and C, the residual volume of 8 to 10 MBF per acre would maintain the most desirable old-growth characteristics. See *FIGURE IV-1 - Areas in the Chicken/Werner Project Area Meeting DNRC's Old-Growth Definition, which shows the proposed harvest unit overlap*. This map shows Alternative B, which encompasses the highest number of harvest acres.

Cumulative Effects

Common To All Alternatives

Past road construction, timber sales, and wildfires have led to the current amount of old-growth characteristics in this area. It is likely that future salvage sales and thinning projects, including those already mentioned in Chapter I, would continue to take place in the analysis area. If additional management projects were proposed, the MEPA process would be implemented.

A USFS proposed broadcast burn to regenerate whitebark pine would take place after 1999 just south of the project area in NW1/4, Section 5, T32N, R22W. This burn would decrease old-growth by a small amount in the general vicinity of the project. No timber harvesting is likely to take place on adjacent sections of USFS land. Therefore, old growth would not decrease due to USFS timber sales.

PCTC is managing their lands intensively and has not committed to any old-growth retention on their ownership. Therefore, remaining old growth is likely to be harvested, which would diminish the amount of old growth in the general vicinity of the project area.

Old-Growth Commitments

Table IV-8 shows the amount of old growth remaining on the forest after alternatives are implemented. The information includes:

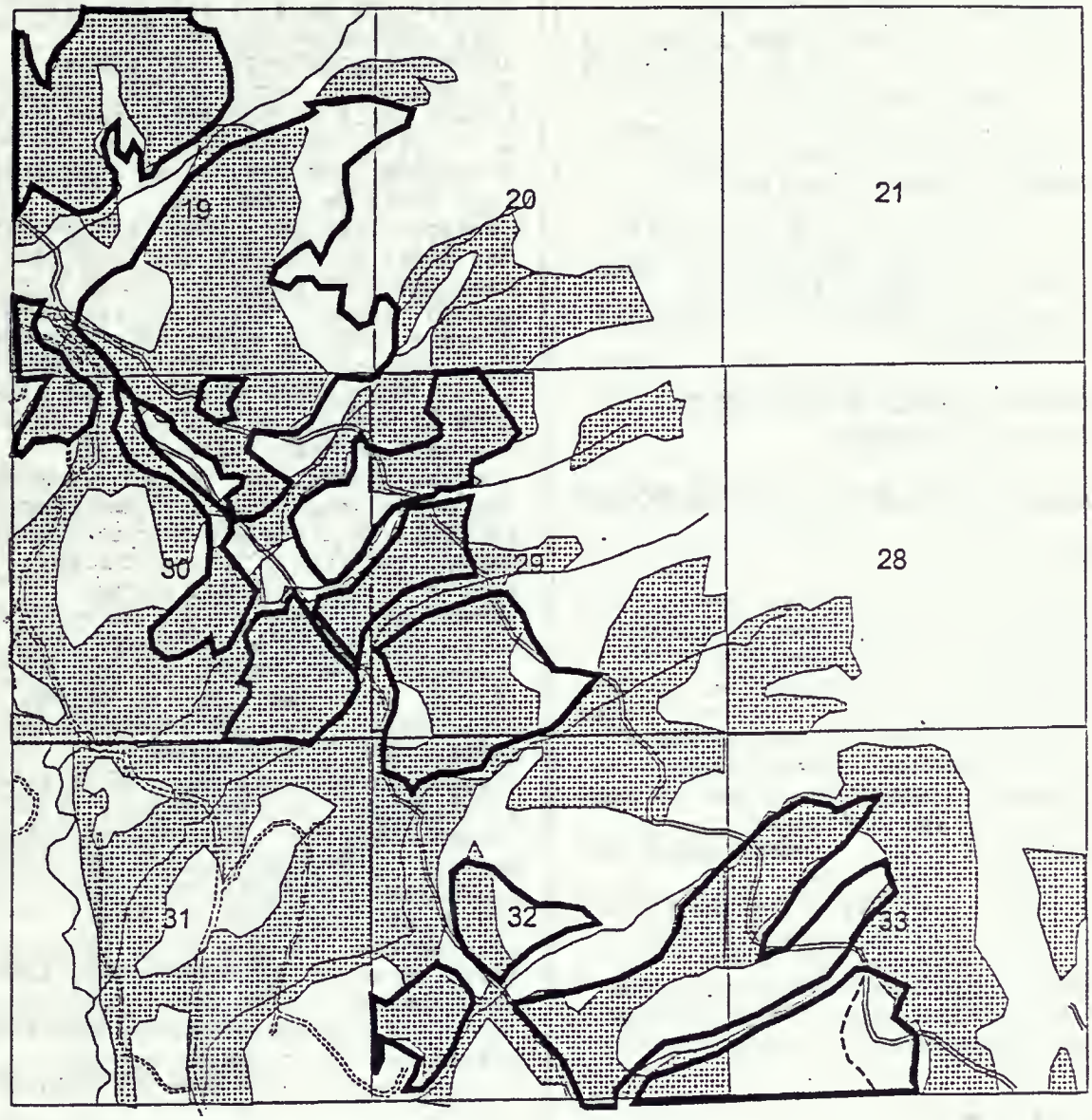
- the cumulative effects to the

TABLE IV-8 - REMAINING ACRES OF OLD GROWTH BY COVER TYPE ON STILLWATER STATE FOREST AFTER ALTERNATIVES HAVE BEEN IMPLEMENTED

COVER TYPE	ALTERNATIVES					
	A	B	C	D	E	DNRC'S MINIMUM OLD-GROWTH RETENTION COMMITMENT
Subalpine fir	10,197	10,178	10,195	10,178	10,195	2,268
Douglas-fir	250	250	250	250	250	31
Lodgepole pine	253	254	254	254	254	299
Mixed conifer	7,904	7,394	7,564	7,675	7,709	1,831
Ponderosa pine	31	31	31	31	31	11.4
Western larch/ Douglas-fir	9,459	9,934	9,822	9,702	9,650	9,452
Western white pine	6,359	6,320	6,307	6,320	6,307	817
TOTALS	34,505	34,412	34,474	34,461	34,447	14,717

AREAS IN THE CHICKEN/WERNER PROJECT AREA MEETING DNRC'S OLD-GROWTH DEFINITION

FIGURE IV-1



LEGEND

Approximate area that meets DNRC's minimum old-growth definition

Proposed harvest units

N

08-Apr-99

amount of old growth and considers past harvesting;
- current projects where a decision has been made, but harvesting has not yet occurred; and
- estimated effects from proposed alternatives on the Chicken/ Werner Timber Sale Project.

These acreages include old-growth stands that have been, or will be, entered with timber harvests; consequently, cover-type conversion has occurred.

Network of Old-Growth Stands on Stillwater State Forest

Direct, Indirect, And Cumulative Effects

Alternative A

Alternative A, the No-Action Alternative, would have no direct effect on the current amount, distribution, or value of old growth on the forest. Over time, the percentage of mixed conifer and subalpine fir cover types may increase slightly due to the lack of disturbance and continued fire suppression. Other timber sales on Stillwater State Forest are currently being harvested and would convert mixed conifer and subalpine fir cover types to the western larch/Douglas-fir cover type; thus, offsetting the effect of no action on this project at the landscape level.

Alternatives B and C

Alternatives B and C would enter Units 18 and 19 adjacent to the perennial creek near the northern boundary of the project area; Alternative B would also enter Units 20 and 21 (helicopter) in the same area. These units have moderately high old-growth attributes that connect to additional stands northwest of the project area that also have moderately high old-growth attribute levels. Following harvesting, these units would still meet DNRC's old-growth definition and provide a corridor of mature forest from the patches northwest of the project area to the riparian area associated within the abovementioned perennial stream. For the short term, the attribute levels would be lowered somewhat by a reduction in stocking levels, decadence, and structural diversity. This would be taken into consideration for future management decisions concerning the long-term management of these and other old-growth stands. The other proposed harvest units in these alternatives that currently meet DNRC's old-growth definition have been entered with harvesting in the past. This has reduced their value as old growth. Therefore, these stands are not being considered for management as high-attribute old-growth stands, except, possibly, in the distant future as they develop higher attributes. None of the harvest units that would be entered, with the exception of Units 18, 19, 20, and 21, were identified as having high value to provide connectivity between old-growth stands; therefore, entering them would have little affect on the overall old-growth situation on Stillwater State Forest. Old-growth stands that are predominantly western red cedar would not be entered with this alternative. Review of Stillwater State Forest's SLI shows there are many options in the 100-to-150-year age class for old-growth recruits; therefore, the proposed harvest would have little effect on future options.

Alternatives D and E

Alternatives D and E would not enter Units 18, 19, 20, and 21. The areas that would be entered and meet DNRC's old-growth definition have been entered in the past with harvesting that has reduced their value as old growth. Therefore, these areas are not currently being considered for management as high-attribute old-growth stands, though they may be considered in the distant future as they develop higher attributes. None of these

proposed harvest units would provide important connectivity between old-growth stands; therefore, entering them would have little effect on Stillwater State Forest's old-growth status. The effects of these alternatives on the old-growth condition on the forest would be limited to a minor reduction in the total amount of old growth. The reduction in old-growth would be limited to the mixed-conifer and subalpine fir cover types, which are far above the estimated historic conditions. These cover types would convert to a western larch/Douglas-fir cover type of a younger age class. Other ongoing harvests on Stillwater State Forest are also converting stands from mixed-conifer and subalpine fir cover types to western larch/Douglas-fir cover types. The cumulative effect would be to trend cover types toward DNRC's desired future conditions. Old-growth stands that are predominantly western red cedar would not be entered with this alternative. The Stillwater SLI shows there are many options in the 100-to-150-year age class for old-growth recruits; therefore, the proposed harvest would have little effect on future options.

Old-Growth Attributes

Large Live Trees

Direct and Indirect Effects

No-Action Alternative A

- The amount of large live old-growth trees will likely stay the same for the short term and decrease over time as more large tree mortality takes place.
- The average diameter of large live trees would continue to increase at their current rate of growth in the short term.

Action Alternatives B, C, D, And E

All of the healthy disease-free trees, with the exception of lodgepole pine, Engelmann spruce, subalpine fir, and grand fir, would be retained in the old-growth stands proposed for harvesting. The change in stocking levels will likely decrease the stress on these trees, which would increase vigor and, very likely, increase their resistance to insect and disease mortality. At the same time, trees that are "almost large" (17 inches to 20 inches dbh) may experience an increase in vigor and growth rates from the reduction in stocking levels; therefore, they may sooner become larger trees.

The reduction of stocking levels in a stand does increase the risk of blowdown; however, since many of these stands have been entered before and stocking is not extremely dense, most of these trees are likely quite wind firm. The species targeted for retention (Douglas-fir, western white pine, and western larch) are also known to have deeper root systems and are less susceptibility to blowdown than spruce, lodgepole pine, or hemlock.

Cumulative Effects

Common To All Alternatives

Other proposed actions and current timber sales on State trust lands *(see Chapter I)* may increase the number of large live trees over time through stand release. In the short term, the number of large live trees may decrease through harvesting activities by the removal of high-risk trees.

Intensive land management on PCTC ownership would likely contribute to a decrease in the amount of large live trees (17-inch-plus dbh) over time.

Very few timber-harvesting activities have taken place on USFS in the recent past, nor are activities likely to take place in the immediate future; therefore, large live tree numbers should increase over time.

Alternative A

Without natural wildfire, storm, insect, or disease events, the frequency of disturbance would decrease in the absence of the proposed management activities, thereby increasing the amount of large live trees over time.

Common To Alternatives B, C, D, and E

Proposed management activities may act together with unforeseen disturbance events to increase the overall frequency of disturbances in this area. Future wildfires or thinning projects in the same geographical location would likely increase the number of large, live trees as a result of stand release.

Coarse Woody Material

Direct and Indirect Effects

No-Action Alternative A

The amount of large coarse woody material on the ground in old-growth stands should increase over time as more large-tree mortality takes place.

Action Alternatives B, C, D, And E

Following timber harvesting, the amount of coarse woody material on the ground would likely increase due to mitigation measures that require on-site retention of up to 15 tons of large and small woody material. Leaving up to 15 tons of coarse woody debris per acre would increase existing fire hazards in the short term; however, the hazard reduction law would still be met. These mitigation measures would be clearly specified in the Timber Sale Contract and enforced by the sale administrator during log manufacturing within the harvest unit. This would assure that much of the cull material (greater than 15 inches in diameter) is left on site. This larger material is important to wildlife habitat and the nutrient-recycling processes that occur in forest soils. Over the long term, by decreasing the stocking density, there would be fewer large woody recruits and the amount on the ground would likely decrease.

Cumulative Effects

Common to all Alternatives

Over time, along with other proposed sales on State, USFS, and PCTC, existing snags, snag recruits, and diseased trees would fall and continue to replace decomposing coarse woody material. These accumulations on the forest floor are directly related to the frequency and severity of fire.

Snags Per Acre

Direct and Indirect Effects

No-Action Alternative A

The number of snags would increase in the short term; in the absence of large-scale wildland fires, the number of snags would also increase over the long term.

Action Alternatives B, C, D, And E

The overall amount of snags per acre may decrease slightly due to harvesting activities. In addition, some suppressed or diseased trees that have snag-recruitment potential would be harvested. The following mitigations would be implemented to help retain as many large valuable snags as possible in the stands being entered:

- No large snags that are valuable to wildlife would be designated for harvesting as long as Occupational Safety and Health Administration (OSHA) regulations are met.
- Large snags and live, broken-topped culls that would make valuable wildlife habitat in the future will be marked for retention.
- Clumps of other trees adjacent to

large snags or culls will be marked for retention to protect the snags/ culls during harvesting activities.

- Logging contractors will be required to plan skidding activities to protect snags.

Cumulative Effects

Common to all Alternatives

Given the current level of moderate insect and disease activity in the project area, the number of large snags would increase over time. Within State trust lands, ongoing timber sales and proposed actions *(see Chapter I)* would probably decrease the amount of large snags over the short term because some of the harvested live trees would eventually become snags. The harvesting of snags for firewood, which probably only occurs within 300 feet of open roads, would continue in the project area.

Due to a decline in USFS timber sales, the number of snags per acre would likely increase on USFS ownership, while on PCTC land, due to the intensive harvesting of large live trees, the number of future snags would likely decrease.

Tree Vigor "Decadence"

Direct and Indirect Effects on Vigor

No-Action Alternative A

The combination of increased stocking density, mortality, and overall stand age should lead to a reduction in stand vigor and an increase in the decadence of old stands within the project area.

Action Alternatives B, C, D, And E

When using stand vigor as a surrogate for decadence, it is likely that decadence in the old-growth stands being entered will slightly decrease and vigor will increase. Over time, this would be a positive effect in relation to holding these stands in their current age class; however, retaining some old-growth stands with a high amount of decadence is desirable on a landscape level. Since most stands being entered with this proposed project are in the good-to-average vigor class, the opportunity for retaining trees with a large amount of decadence does not exist. Since the amount of decadence in the stands being entered will change only slightly from existing conditions, the change in old-growth stands over the entire Stillwater State Forest will be slight and no shortage of old growth with a particular degree of decadence would be caused.

Because the retention trees in these old-growth stands are already mature or quite old, there may not be a noticeable growth response to a thinning. Many species will not respond to thinning after they reach 50 to 70 years old, while others may have an increased rate of growth. In either case, the stands that show increases in vigor are likely to decrease again as stocking densities increase.

Cumulative Effects

Common to all Alternatives

In time, whether an action alternative is chosen or not, stocking densities would, generally, increase. If management activities on State trust lands do not occur at regular intervals, stand vigor would be reduced due to competition, mortality, insect infestations, and disease. In the short or long term, a potential wildfire would likely reduce stocking densities and improve the level of vigor in the project area. Current and future management activities *(see Chapter I)* will increase stand vigor within the analysis area through stand release.

PCTC stand vigor should increase substantially due to intensive harvesting activities, while the lack of disturbance on USFS

ownership will contribute to a decline in stand vigor within the general vicinity of the project area.

SENSITIVE PLANTS

Direct and Indirect Effects

No-Action Alternative A

No direct or indirect effects to sensitive plants would result by this alternative.

Action Alternatives B, C, D, and E

- No harvesting or burning is planned in riparian habitat or wet cedar pockets where the identified sensitive plant Mountain Moonwart (*Botrychium montanum)* is known to occur. No action alternative would contribute to the loss of population viability of this sensitive species. If this species or other sensitive plant species are discovered during the implementation of the Chicken/ Werner Project, modification and mitigation measures would be applied on a per-site basis to ensure their protection.

- If any herbicide treatment to control noxious weeds is proposed in the future, it would not be applied in or near the riparian zones where the *Botrychium* species are likely to occur.

Cumulative Effects

Common to All Alternatives

Past road construction, timber sales, and wildfires have led to the existing condition of sensitive species in the area. It is likely that future salvage sales and thinning projects, including those already mentioned in Chapter I, would continue to take place in the analysis area. However, sensitive plant surveys would be done prior to each proposed action, and mitigation measures would be done to protect sensitive species that are discovered. This would minimize the effect of timber harvesting on local sensitive plant populations.

A USFS proposed broadcast burn to regenerate whitebark pine would take place after 1999 just south of the project area in NW1/4, Section 5, T32N, R22W. A sensitive plant survey was not conducted in this area, as it was determined by a USFS botanist that broadcast burning has little or no effect on sensitive plant populations. No timber harvesting is likely to take place on the adjacent sections of USFS land; therefore sensitive plants would not be in jeopardy from timber harvesting.

PCTC has not conducted a formal sensitive plant survey on their ownership. Sensitive plants identified during the survey conducted for the Chicken/Werner Timber Sale Project are limited to riparian habitats that are usually protected from timber harvesting. Therefore, it is likely that similar species exist on PCTC ownership and would be protected with SMZ buffers.

No-Action Alternative A

All existing vegetation would continue to be affected by natural processes (flooding, wildfires, channel migration, etc.).

Action Alternatives B, C, D, and E

- An increase in use by some wildlife species would likely occur where the forest canopy is opened up and forage is increased. Depending upon the palatability of mountain moonwart, wildlife populations may have some impact on this species.

- There is an increased potential for noxious weeds to spread or be introduced during the proposed road reconstruction and harvesting activities. Noxious weeds can outcompete many native species for space, light, nutrients, and water. Measures would be taken to prevent the introduction or spread of

noxious weeds into the project area. (See *NOXIOUS WEEDS.)*

NOXIOUS WEEDS

Direct and Indirect Effects

Weed seed is currently being dispersed in the area primarily from motorized vehicle use. Other possible sources of weed introductions are from hiking, hunting, horseback riding, and bicycling activities. These activities would continue with the No-Action Alternative and are likely to increase with the continued population growth in Flathead Valley.

No-Action Alternative A

Since Alternative A would not expose a great deal of mineral soil in the area, except where road maintenance or motorized recreation takes place, a slow steady increase of weed populations will likely continue.

Action Alternatives B, C, D, and E

In Action Alternatives B, C, D, and E, similar levels of disturbance would expose mineral soil and increase the likelihood of noxious weeds becoming established. These alternatives include proposals to reconstruct Werner Peak Road and improve segments of the Lower Jellison and Lower Whitefish roads. Road improvements would consist of widening roads, constructing safety turnouts, and replacing culverts. All of the action alternatives would include logging activities where yarding logs would require skid trails and landings. All of these activities would expose some mineral soil, leaving an area where weed seed is easily established.

Each action alternatives is very similar in the amount of mineral soil that would be exposed; Alternatives B and C have the highest number of log landings and would, therefore, have the highest potential for noxious weed problems.

Each of the action alternatives would improve the existing road standards, thus, recreational use in the area would probably increase. This would be particularly true of Werner Peak Road, which is now difficult to maneuver with a low-clearance vehicle. This likely increase in recreational use may prove to be a major source of weed-seed dispersal.

The harvest proposals in all of the action alternatives would include additional sources of weed-seed introduction with the operation of heavy equipment and log-truck traffic in the area.

Noxious Weed Mitigation Measures

In accordance with the Flathead County Weed Management Plan, an ongoing program of weed monitoring and spot spraying will occur in the area.

Mitigation measures for all action alternatives would include contract clauses that require the following:

- Heavy equipment used for timber harvesting and road construction must be washed thoroughly to eliminate weed seed before it is brought onto State lands.
- Following road construction and improvement activities, disturbed areas will be seeded with a native grass seed mix. Grass seeding is required concurrently with construction activities in an attempt to control erosion and establish grass before weed seeds are introduced.
- Lower Jellison Road is gated and closed to motorized traffic. This would decrease the total amount of disturbed ground susceptible to the spread of noxious weeds from motorized traffic.

Cumulative Effects

No-Action Alternative A

Past, present, and future activities on State forest lands contribute cumulatively to the spread of noxious weeds. State land-management activities, including general public recreation, as well as those occurring on adjacent ownership lands, are likely to continue and would increase the spread of noxious weeds.

With the adoption of the SFLMP, a more aggressive program for inventorying and treating noxious weeds on Stillwater State Forest would likely occur, resulting in having this done on a more regular basis than has occurred in the past. This ongoing treatment for noxious weeds should help mitigate for the increased use of the area and may actually reduce the population of weeds over the long term.

Alternatives B, C, D, and E

As with No-Action Alternative A, land management activities on adjacent ownerships would also likely contribute to the slow spread of noxious weeds on State forest land.

While these ongoing activities would increase the risk of noxious weed populations in the area, a combination of mitigations that includes ongoing weed monitoring and spot spraying of herbicides may actually reduce the overall population of weeds over time.

AIR QUALITY

DIRECT AND INDIRECT EFFECTS

No-Action Alternative A

No-Action Alternative A would not create impacts to air quality beyond existing levels. Over the long term, road dust during summer months would increase as recreational traffic increases.

Action Alternatives B, C, D, and E

Depending on the season, log hauling and related traffic on dry roads may increase the amount of road dust. The portion of Lower Whitefish Road that is south of the project area would not be used to transport logs to the mill; therefore, the most severe effect from road dust may occur along Upper Whitefish Road. Depending upon the amount of traffic and the season that logging occurs, dust abatement may be applied along portions of this road segment. *(See Appendix A, Stipulations and Specifications.)*

The postharvest burning of logging debris would produce particulate matter. It is unlikely that smoke columns generated by burning would reach populated areas in Flathead County. The stipulations and specifications listed for air quality in Appendix A should prevent road dust from impacting populated areas and limit the impacts from burning to levels not exceeding EPA/State/County/local standards.

CUMULATIVE EFFECTS OF ALTERNATIVES A, B, C, D, AND E

Cumulative effects to air quality would not exceed the levels defined by the State of Montana Cooperative Smoke Management Plan (1988) and managed by the Montana Airshed Group.

The proposed USFS prescribed burn on Werner Peak would have the potential to affect air quality; however, both USFS and PCTC currently operate

USFS and PCTC currently operate under the same Airshed Group guidelines as the State and would burn only on approved burn days.

WILDFIRE HAZARDS AND RISKS

DIRECT AND INDIRECT EFFECTS

No-Action Alternative A

If Alternative A were chosen, the wildfire hazard would not change substantially in the short term. Eventually, due to the accumulation of fine fuels, snags, ladder fuels, and dead wood components, the likelihood of a stand-replacement fire would increase.

Alternatives B, C, D, and E

With the implementation of any action alternative, wildfire hazards would be reduced to a slightly different level. The level of reduction is directly related to the number of acres proposed for treatment by alternative.

Immediately following timber harvesting, there would be an increase in the amount of fine flashy fuels. DNRC's hazard reduction program requires that measures be taken to minimize the hazards of wildfires. These mitigations are included in our current State Hazard Reduction Guidelines. Those specific to this sale are located in Appendix A, Stipulations and Specifications.

All harvest methods prescribed for the 4 action alternatives would reduce ladder fuels through the harvest of Engelmann spruce, subalpine fir, and grand fir, which present a higher crown-fire risk because of their low-growing branches.

Fire-resistant trees, such as western larch and Douglas-fir, left in the stands would be more likely to survive as a result of low-intensity burns and ground fires.

CUMULATIVE EFFECTS

Alterntives A, B, C, D, and E (common to all alternatives)

Whether or not an action alternative is selected for this project, the long-term hazards of wildfire would continue to increase as a result of long-term fire suppression. Fuel buildups are unusually high in the upper elevations of the project area where large areas of whitebark pine is dead or dying; these stands are visible from the Upper Whitefish Road vantage point mentioned in *Chapter III, VISUALS*. Forest land adjacent to the project area, both State and USFS ownership, has a high proportion of dead and dying subalpine fir, western white pine, and lodgepole pine from recent and current beetle activity. Adjacent stands within Plum Creek ownership have been recently harvested and do not pose as great a fire hazard.

AESTHETICS

DIRECT AND INDIRECT EFFECTS

Existing visual characteristics are described in Chapter III from various viewpoints. The project area is visible from a long distance; the selection of any action alternative would have some visual impacts. Early in the project-development phase, measures that might minimize visual impacts were considered and incorporated into the harvest prescriptions. These measures include the following:

- Harvest units would not have straight edges or squared-up boundaries along adjacent ownership.
- Wherever applicable, unit boundaries would be marked in size and shape to emulate natural wildfire disturbances.
- Individual trees would be left along unit edges to feather the

sharp contrast between logging units and heavily-stocked forest stands.

- A relatively high volume of mature trees would be left in the stand as residuals to help minimize visual impacts. This would meet many of DNRC's other silvicultural objectives as well.

- To the extent possible with the limited distances between thinning corridors and leave trees along the road edge, Werner Peak Road would remain screened from view.

- It should be noted that some stands contain a high percentage of western larch, which would not provide effective visual buffers or screening in the winter months. This was taken into consideration where there were other options.

The effects of the harvest treatments would be most notable to visitors along the open roads within the project area. The *Description of Silvicultural Treatments in Chapter II* provides graphical effects of the proposed treatments. The visualizations portray the geographical distributions of treatment effects across a harvest unit. The combination of the Harvest Treatment Maps and proposed silvicultural treatments provide a qualitative approach to the visual effects that may be seen.

No-Action Alternative A

If Alternative A were selected, views of the project area would not change.

Alternative B

Alternative B proposes the harvest with the highest volume on the largest number of acres and includes 9 optional helicopter logging units, which are located in the most visible (higher elevations) portions of the project area. Several of the helicopter units are composed of a high percentage of dead and dying lodgepole pine and western white pine. Although the largest and healthiest trees would be left, those stands would be opened up significantly and would be viewed from many miles away. This harvest would be visually similar to the results of an unsuppressed lightening fire on this slope. The use of helicopters to yard the logs out of these 9 units would make them less detectable from a distance by softening the harvest boundary. Due to the higher amount of acres and volume being harvested, Alternative B would move the aesthetic characteristics furthest from the existing conditions.

Alternatives C

Helicopter logging is not an option in Alternative C; therefore, visual impacts would be somewhat less than in Alternatives B and D because no logging would take place above 5,800 feet in elevation. The proposed harvest prescriptions for each unit are the same in every alternative, so the visible results of harvesting the cable and tractor units would not change. Alternative C proposes harvesting in the older stands in Section 19 that were left out of Alternatives D and E. The prescriptions for those stands were designed to maintain old-growth attributes and unusually high postharvest volumes. This would likely ensure there would be fewer changes in the existing aesthetic characteristics under Alternative C.

Alternatives D

Alternative D includes 7 of the 9 optional helicopter units from Alternative B. These units would have more substantial changes in visuals than the tractor and cable units. This alternative has no harvest units in Section 19.

Alternative E

Next to No-Action Alternative A, Alternative E would have the least visual changes. This alternative proposes several cable logging units. No harvesting would take place in Section 19. Alternative E is restricted to 4 of the 6 sections in the project area and, like Alternative C, there is no harvesting above 5,800 feet in elevation.

CUMULATIVE EFFECTS

All Alternatives - A, B, C, D, and E

Views from the previously mentioned viewpoints (Chapter III) would not change on State ownership in the near future, excluding natural events such as wildfire, blown down timber, insect outbreaks, and disease-related mortality.

Timber harvesting on adjacent sections would likely continue and may be visible on the landscape.

The USFS has proposed a prescribed burn south of the project area to regenerate whitebark pine in Section 5, T32N, R22W. The burn is at a high elevation on the Whitefish Divide and would be clearly visible from Upper Whitefish Road; however, the visual effect would be short term. USFS does not have any timber sales proposed in this vicinity in the near future.

PCTC would likely continue to manage their lands intensively; however, their Habitat Conservation Plan with United States Fish and Wildlife Service (USFWS) that requires residual hiding cover for grizzly bears. Therefore, future harvests will not have the same level of visual impact that past harvesting has had.

Some segments of existing roads may receive maintenance brushing, which would increase visibility around curves and into forested stands. As trees continue to grow along the roadside segments that are not maintained, views into the adjacent forest stands would be more limited.

WILDLIFE

INTRODUCTION

In this chapter, the effects of the alternatives are addressed. The effects of the action alternatives are compared to the existing condition to assess the effects of the project on a species' habitat. Again, this analysis occurs in 2 scales, the project level and the landscape level.

For the cumulative effects analyses, completed projects that fell within the analysis area were analyzed as a completed project in the coarse-filter analysis Activities on PCTC and USFS were considered if they fell within the analysis area of the species being discussed. No specific projects were identified on PCTC lands, therefore, harvesting in the general area was assumed to continue. Only the proposed prescribed burn on USFS lands southeast of the project area was considered.

METHODS

The methods used to assess the impacts to each species are discussed under Methods and under each specific species in Chapter III where additional methods are used.

Coarse-Filter Assessment

Under the No-Action Alternative, forest conditions in the project area and on Stillwater State Forest would continue to trend toward climax. This situation would benefit species that require shade-tolerant tree species and closed canopy for all or part of their habitats.

The action alternatives are similar in their effect on wildlife species. Wildlife species that require an open canopy, large amounts of understory, and/or shade-intolerant

tree species as all or part of their habitat would be positively affected. Species that are dependent upon alpine fir and grand fir habitats would be negatively affected proportionally to the reduction in acreage realized under each action alternative. Conversely, species for which western larch and/or Douglas-fir habitats play an important role would benefit in a proportion similar to the size of the harvest units. Forest cover types would be moved toward historic conditions, benefiting species that require open forest canopies and shade-intolerant tree species.

Patch Size

Patch size correlates strongly with the number of species and individuals that the patch can support (May 1975). The size of habitat patches affect wildlife by providing interior habitat. In the Northern Region of the USFS, it is believed that 60% of the species associated with old growth require at least 80 acres (Hager 1986). This patch size is similar with the Rosenberg and Raphael (1986) recommendations of an effective patch size of 125 acres. For this analysis, the difference was split and the effects of the project on patch size (cover types and age classes) above and below 100 acres were analyzed. Since effects to patches less than 100 acres are expected to produce minimal effects to wildlife species, only effects to large patches (more than 100 acres) will be discussed. Since any changes in the project area will directly affect the cumulative analysis for Stillwater State Forest, only the cumulative effects will be discussed.

The existing condition of patch size and shape are discussed in *Chapter III, VEGETATION*. The alternatives considered in the Chicken/Werner Project may affect subalpine fir, lodgepole pine, mixed conifer, western larch/Douglas-fir, and western white pine cover types. Under the No-Action Alternative, patch size of shade-tolerant cover types would be expected to increase, while patch size of shade-intolerant species would decline. Under the action alternatives, only large patches in the mixed-conifer and western larch/Douglas-fir cover types would be affected. Under Alternative B, the number of patches of the mixed-conifer cover type over 100 acres would be reduced by 2. Under Alternative C, D, and E, only 1 of these patches would be removed. Under Alternative B, western larch/ Douglas-fir patches over 100 acres would increase by 2. Under Alternative C, only 1 patch would be added. Under Alternative D and E, no change would occur *(Table IV-9)*. The reduction of mixed-conifer

TABLE IV-9 - NUMBER OF COVER TYPE PATCHES GREATER AND LESS THAN 100 ACRES UNDER EACH ALTERNATIVE ON STILLWATER STATE FOREST

COVER TYPE	PATCH SIZE	ALTERNATIVE				
		A	B	C	D	E
Subalpine fir	Less than 101 acres	81	83	81	83	82
	More than 100 acres	11	11	11	11	11
Lodgepole pine	Less than 101 acres	100	104	103	104	103
	More than 100 acres	14	14	14	14	14
Mixed conifer	Less than 101 acres	116	124	121	121	120
	More than 100 acres	37	35	36	36	36
Western larch/ Douglas-fir	Less than 101 acres	142	142	143	146	144
	More than 100 acres	31	33	32	31	31
Western white pine	Less than 101 acres	32	33	34	34	34
	More than 100 acres	17	17	17	17	17
All cover types	Less than 101 acres	654	677	674	679	674
	More than 100 acres	115	115	115	114	114

TABLE IV-10 - NUMBER OF PATCHES OF AGE CLASSES GREATER AND LESS THAN 100 ACRES ON STILLWATER STATE FOREST UNDER EACH ALTERNATIVE

AGE CLASS	PATCH SIZE	ALTERNATIVE				
		A	B	C	D	E
None	Less than 100 acres	115	122	122	122	122
	More than 100 acres	3	3	3	3	3
0-39 years	Less than 100 acres	115	115	115	115	115
	More than 100 acres	17	18	18	18	18
40-99 years	Less than 100 acres	142	152	151	150	149
	More than 100 acres	21	21	21	21	21
100 to 149 years	Less than 100 acres	210	209	210	210	209
	More than 100 acres	46	46	46	46	46
150+ years	Less than 100 acres	85	95	95	96	96
	More than 100 acres	30	31	31	31	31
All age classes	Less than 100 acres	767	793	793	793	791
	More than 100 acres	117	119	119	119	119

patches may impact species such as pine marten. Conversely, the increase in western larch/Douglas-fir cover-type patches over 100 acres may benefit species such as pileated woodpeckers. However, these changes are slight and are expected to produce minimal changes to wildlife habitat.

Age classes also can provide patches of habitat. Under the No-Action Alternative A, the patch size of the older age groups is expected to increase. This situation would benefit old-growth interior species, such as goshawks. In response to this project, only patches over 100 acres of the 0-to-39-year and old-growth age class would be affected. Under all action alternatives, the number of 0-to-39 and old-growth patch sizes would increase by 1 in each class *(Table IV-10)*. The change in the number of patches in the 0-39-year age class may benefit species such as big game by providing hiding cover. Similarly, the increase in the number of large patches of old growth may benefit species such as goshawks. However, these changes are slight and are expected to produce minimal changes to wildlife habitat.

Patch shape is not expected to change significantly in response to this project *(refer to Chapter IV, VEGETATION)*. These changes are slight and are expected to produce minimal changes to wildlife habitat.

Snag and Downed Woody Material Management

Under Alternative A, the No-Action Alternative, snags and downed woody material would increase under a relatively closed forest canopy. In the long term, snags and downed woody material would shift from shade-intolerant to shade-tolerant tree species. In the short term, wildlife species associated with snags and down woody material from shade-tolerant species would benefit from the increase in structure. In the long term, shade-intolerant tree species would die out and be replaced by shade-tolerant tree species. In general, shade-intolerant tree species would die out and be replaced by shade-tolerant species. In general, shade-intolerant tree species are favored by cavity nesters and wildlife species that use cavities in downed woody material because of the physical structure of the heartwood and sapwood.

Under Alternatives B, C, D, and E, the action alternatives, all existing snags, except those that are deemed safety hazards, would be

retained in the harvest units. Cull trees (part or all) and hazard snags that are cut for safety would be left on site. Therefore, the forest canopy would be reduced, snag densities would be slightly reduced, coarse woody material would be increased, and trees retained may release and have an increase in growth rate. In the harvested areas, cavity-nesting species, such as the mountain bluebird, that use open areas would be benefited at the expense of species, such as the brown creeper, that use similar structures in closed canopy stands. Similarly, species, such as the great gray owl, that use habitats with coarse woody material in open canopies would be benefited at the expense of species, such as pine martens, that use coarse woody material in closed canopies.

Fine-Filter Assessment

The wildlife report is broken down into 2 sections: the coarse-filter and fine-filter assessments. Under the fine-filter assessment, effects on threatened, endangered, and sensitive species are analyzed. Therefore, there is no text to enter here, because it is included under the subheadings "Threatened and Endangered Species" and "Sensitive Species".

THREATENED AND ENDANGERED SPECIES

Grizzly Bear

Direct and Indirect Effects

No-Action Alternative A

Under the No-Action Alternative, increased disturbance to grizzly bears would not occur. Hiding cover would not be reduced.

Action Alternatives B, C, D, and E

This project may affect grizzly bears directly through increased road traffic, noise, and human activity, and indirectly by altering the amount of hiding cover and forage resources. Under Alternatives B and D, temporary disturbance to grizzly bears is expected to be higher than under Alternatives C and E due to the possible use of helicopters to transport timber from the harvest units to the landings (Quimby 1974). The helicopter units are near or in grizzly bear security core areas. Under Alternatives C and E, only ground-based disturbances would occur. Under Alternative C, harvesting with ground-based equipment would still occur in grizzly bear security core areas in Unit 19. Under Alternative E, no harvesting would occur in any security core area *(see Figure III-13)*. There is additional secure habitat on the east side of Whitefish Divide that may provide areas for bears to disperse from the project area during harvesting activities. Activities in occupied grizzly bear habitat reduce bear security, possibly resulting in increased stress and/or energy expenditure to endure the disturbance or to move from the area. These disturbances would be present only during the harvesting operations.

The season of disturbance is important in addressing the impacts to grizzly bears. Winter harvesting would probably result in negligible direct effects to bears. Secondarily, activities that target time periods when the probability of animals using the area is low would result in reduced direct disturbance to grizzly bears in the nondenning period. Units 12, 13, and 17 occur in spring habitat under all action alternatives; harvesting later in the year (after July 1) would reduce harvesting disturbance to grizzly bears. Under Alternatives B and D, disturbance effects to grizzly bears would be minimized if harvesting above Werner Peak Road occurred early in the year (before July 1) and/or during winter when grizzlies are not expected to use the area extensively. Due to high snow

levels, this timing is probably unrealistic. Summer harvesting would probably result in less direct impacts than autumn harvesting. Harvesting these units during autumn would potentially pose the most negative direct impacts to grizzly bears.

Timber harvesting can reduce hiding cover. Hiding cover is especially important along roads and in areas that receive human disturbances. Under all action alternatives, timber harvesting would reduce hiding cover in every unit entered *(see Table IV-11)*. Some pockets of cover would be maintained within the units; therefore, these figures represent liberal estimates of the potential loss of hiding cover in the project area. Cover would be retained along riparian bottoms and between units to provide screening and facilitate grizzly bear travel. Hiding cover in the harvested units is expected to regenerate within 25 years.

TABLE IV-11 - MINIMUM ACRES OF GRIZZLY BEAR HIDING COVER IN THE CHICKENWERNER TIMBER SALE PROJECT AREA AFTER IMPLEMENTATION OF THE PROPOSED ALTERNATIVES

EXISTING (ALTERNATIVE A)	B	C	D	E
3,527	2,266	2,638	2,611	2,841

Canopy-cover reduction and postharvest burning may stimulate berry-producing plants and other forage (Marten 1979, Zager 1980). However, mechanical scarification or a hot fire may reduce the response of berry-producing plants (Zager 1980). In areas with large berry-patches, attempts would be made to avoid these patches or minimize damage to the plants when mechanically scarifying the area.

Cumulative Effects

No-Action Alternative A

Under the No-Action Alternative, motorized access to the area would likely remain unchanged. Forest succession would continue and may reduce food sources for grizzly bears, but increase the amount of hiding cover. Since hiding cover does not appear limiting in the subunit, maintaining this cover at the expense of food resources may reduce the quality of grizzly bear foraging habitat in the subunit through time.

Action Alternatives B, C, D, and E

Under the action alternatives, grizzly bear hiding cover could be reduced and road disturbance would increase in the Lazy Creek Subunit. The loss of hiding cover due to this project would add to other losses of hiding cover due to harvesting on PCTC lands and the proposed prescribed burn on USFS lands *(see Table IV-12)*. The USFS prescribed burn is expected to increase whitebark pine, which produces nuts that are an important fall food source for bears. Road disturbance is measured within a BMU subunit by using a moving-windows analysis described by Ake (1994). When POR and PTR exceed 1 mile per

TABLE IV-12 - EXISTING AND MINIMUM % OF GRIZZLY BEAR HIDING COVER REMAINING ON STATE TRUST LANDS AND ALL OWNERSHIPS IN THE LAZY CREEK SUBUNIT AFTER IMPLEMENTATION OF THE PROPOSED ALTERNATIVES

LAND OWNERSHIP	ALTERNATIVE				
	EXISTING (A)	B	C	D	E
State trust	92%	84%	86%	86%	88%
All ownerships	62-81%	55-64%	56-65%	56-65%	57-66%

square mile and 2 miles per square mile, respectively, grizzly bears avoid these areas. Under all action alternatives, a .3-mile temporary road would be built to economically harvest Unit 1. The road would be open during the harvesting operation and obliterated afterward by berming, ripping, slashing, and tree planting. During the period when the road is open, motorized access would be allowed. This access would add to the road disturbance in the subunit and was considered an open road in the moving-windows analysis. Building this temporary road would increase the amount of area exceeding POR thresholds by 50 acres (.1%) and PTR thresholds by 132 acres (.4%). Also, this road would result in a loss of 39 acres (.1%) of security core area in the subunit. Since the POR, PTR, and security core area presently is less than the no-net thresholds set by DNRC in 1995, this increase would not violate the DNRC internal guidance. The increases in POR and PTR, and the loss of security core area would be short term. Additionally, since the road goes through the harvest unit and will only be present during the harvesting of this unit, the temporary road probably would not substantially increase disturbance above the level expected by the harvesting activity.

Wolves

Direct and Indirect Effects

No-Action Alternative A

Under the No-Action Alternative, disturbance to wolves through harvesting or road activities would remain constant. Forest canopy closure would continue to decrease big game forage in the area, thereby possibly decreasing big game and wolf use of the area.

Action Alternatives B, C, D, and E

Under the action alternatives, harvesting activities may disturb wolves that inhabit the area. Direct disturbance is most harmful to wolves at denning and/or rendezvous sites. Therefore, if an active wolf den or rendezvous site is documented in or within 1 mile of the project area, informal consultation with USFWS would be immediately initiated.

A temporary road would be constructed, used, and obliterated. The road would increase the open-road density from 1.2 miles per square mile to 1.3 miles per square mile while it is present on the landscape. The road is located on a steep slope and in an area already affected by Lower Whitefish and Werner Peak roads. The effects of this road probably would not add to the disturbance caused by the harvesting operations. The harvest units are expected to increase forage for big game species during the nonwinter period. This effect could result in an increase of big game and wolf use in the area; however, any change is expected to be minimal.

Cumulative Effects

Common to All Alternatives

Little or no timber harvesting has occurred on adjacent USFS ownership in the recent past. Wolf habitat and prey are likely to remain the same or decrease as forest density increases because big game forage is less abundant in areas of heavy canopy closure. Large prescribed or natural fires could alter this condition and improve forage opportunities.

PCTC manages their forest land intensively, providing openings for big game forage opportunities. However, some of these openings are too large for big game to use effectively. Continued harvesting on PCTC ownership may provide forage for big game, thereby supporting wolf populations.

No-Action Alternative A

Under the No-Action Alternative, due to an increase in canopy cover resulting in decreased forage, big game use may shift away from the project area.

Action Alternatives B, C, D, and E

Some slight shifts of big game use may occur in the Lazy Creek BMU subunit. Under the action alternatives, big game use may increase in the project area. Any shifts are expected to be minimal. Travel corridors would be retained throughout the project area, thereby maintaining connectivity to other habitats in the subunit.

SENSITIVE SPECIES

Boreal Owls

Direct and Indirect Effects

Boreal owls appear to tolerate human disturbance and noise (Hayward 1994); therefore, no measurable direct effects to boreal owls are expected under any alternative. Modification in habitat can affect boreal owls.

No-Action Alternative

Under the No-Acton Alternative, canopy closure and tree growth would continue, resulting in additional acres of habitat through time.

Action Alternatives B, C, D, and E

Under all action alternatives, Unit 2 would be harvested, resulting in a potential loss of 22 acres of nesting habitat. Under Alternatives B and D, an additional 35 acres of potential boreal owl nesting habitat would be harvested.

Cumulative Effects

Common to All Alternatives

Potential boreal owl habitat exists to the north, south, and east of the project area. On USFS ownership, the proposed broadcast burn located in the NW1/4, Section 5, T32N, R22W, would likely reduce boreal owl nesting habitat in the general vicinity of the project area. No other timber sale activity is planned within this analysis area or on the adjacent ownership, therefore, additional effects are not anticipated. Boreal owls are not likely to be found on PCTC land, which is too low in elevation to provide adequate boreal owl habitat.

Fishers

Direct and Indirect Effects

No-Action Alternative A

Under the No-Action Alternative, no modification in fisher habitat would occur.

Action Alternatives B, C, D, and E

Under all action alternatives, harvesting is planned in potential fisher habitat. Harvesting in these areas would reduce the amount of resting habitat. Fisher buffers would be maintained within 165 feet on either side of a perennial stream and 83 feet of an intermittent stream. A canopy closure of 70% would be retained within those buffers. These buffer areas would provide the most likely fisher resting habitat and travel corridors through the project area. Increasing the diversity of seral stages within the project area may increase foraging habitat.

Cumulative Effects

Activities on PCTC lands may affect fisher habitat more than on State land due to the elevational location. PCTC harvest strategies may reduce effective fisher habitat around riparian areas, thus increasing the importance of retaining habitat on State trust lands.

No-Action Alternative A

Under the No-Action Alternative, resting habitat would increase in the BMU subunit and travel cover would not be affected.

Action Alternatives B, C, D, and E

Under all action alternatives, harvesting in this area would decrease resting habitat in the Lazy Creek Bear Management Subunit outside of the buffers; however, the buffer set around the riparian areas would retain most of the important fisher habitat in the project area and the Lazy Creek Bear Management Subunit. Additionally, retaining these buffers would maintain travel routes from Swift Creek through the project area to the North Fork watershed.

Lynx

Direct and Indirect Effects

No-Action Alternative A

Under the No-Action Alternative, potential lynx denning habitat would be retained and would increase in quality and quantity through time as trees increase in size, die, and fall to the ground. Lynx foraging habitat in the vicinity would continue to decline through time as stands tend toward climax conditions.

Action Alternatives B and D

Potential denning habitat would be altered under Alternatives B and D. Approximately 105 acres of denning habitat would be harvested. Additionally, 353 acres of potential foraging habitat would be harvested and may provide higher quality snowshoe hare habitat in the future.

Action Alternatives C and E

Potential denning habitat would not be altered under Alternatives C and E. However, 151 acres (Units 1 and 2) of potential foraging habitat would receive treatment, thus providing snowshoe habitat in the future. The harvest strategy in these units calls for burning and planting. This method is expected to decrease the amount of time before snowshoe hares recolonize the unit.

Cumulative Effects

No-Action Alternative A

Under the No-Action Alternative, the amount of lynx denning habitat would increase due to increased forest density in the Lazy Creek Bear Management Subunit, while foraging habitats would decrease through time.

Action Alternatives B, C, D, and E

Under all the action alternatives, travel corridors would be maintained along riparian bottoms and through the harvested stands. Some openings in the harvest units may exceed 300 feet; however, these openings would be scattered throughout the harvest units, which would allow lynx to travel around the openings. Thus a barrier to lynx movements would not be created. This project, in combination with the proposed USFS prescribed burn, may decrease lynx habitat in the analysis area. However, the affected areas do not appear to be high-quality denning areas due to the steep topography.

Pileated Woodpeckers

Direct and Indirect Effects

No-Action Alternative A

Under the No-Action alternative, the existing trees would continue to increase in dbh and, eventually, die, thus providing pileated woodpecker habitat. As these trees die out, however, shade-intolerant species (larch, Douglas-fir, and western white pine) would not replace those that die unless a large natural disturbance takes place. Therefore, under this alternative, pileated woodpecker habitat would increase through time,

then decline.

Action Alternatives B, C, D, and E

Under all action alternatives, high-quality pileated woodpecker habitat exists along Lower Whitefish Road and in Units 18, 19, 20, and 21. Most of the existing snags, cottonwood trees, and large western larch, Douglas-fir, and western white pine trees would be retained in Units 12, 13, 14, and 17; however, most of the grand fir trees would be removed. Nesting structure in snags and snag recruits would be retained, but quality nesting habitat may decline due to the loss of the overstory/midstory canopy cover. The resulting open canopy would allow for natural regeneration and the growth of replacement shade-intolerant tree species to provide nesting structure in the distant future. Under Alternative B, Units 18, 19, 20, and 21 would receive a thinning-from-below treatment. This treatment would retain most of the snags and large shade-intolerant trees. This treatment is believed to produce negligible effects. Under Alternatives D and E, Units 18, 19, 20 and 21 are not proposed for harvesting. Under Alternative C, Units 20 and 21 are not proposed for harvesting.

Cumulative Effects

No-Action Alternative A

Under the No-Action Alternative, pileated woodpecker habitat in and around the project area would increase through time, then decline.

Action Alternatives B, C, D, and E

Under the action alternatives, potential nesting cover would be reduced. Under Alternative B, 146 acres of quality nesting habitat may be reduced through the removal of the midstory canopy, while Alternative C would only impact 88 acres. This would be an additional loss of habitat to past and current harvests on State trust and Plum Creek lands. Both Alternatives D and E would have no habitat modification for pileated woodpeckers.

Townsend's Big-Eared Bats

Direct and Indirect Effects

No-Action Alternative A

Under the No-Action Alternative, no change in use of the project area is expected.

Action Alternatives B, C, D, and E

Under all action alternatives, harvesting activities may displace bats indefinitely. Indirectly, roost sites would be retained through the retention of all hardwoods that are not safety hazards.

Cumulative Effects

No-Action Alternative A

Under the No-Action Alternative, hardwoods would slowly die out of the stands, resulting in a loss of roosting habitat over time.

Action Alternatives B, C, D, and E

Harvesting activities probably would not alter roost sites in the harvest units on State trust or PCTC lands because hardwoods are left on site, though roosting habitat may be disturbed. This disturbance, in combination with activities on PCTC land, may cause bats to choose an alternate habitat or move to another area.

BIG GAME SPECIES

Direct and Indirect Effects

No-Action Alternative A

Under the No-Action Alternative, thermal cover would increase at the expense of forage. Travel corridors through the area would be retained.

TABLE IV-13 - HIDING AND THERMAL COVER ACREAGE (MINIMUM ACREAGE REMAINING AFTER IMPLEMENTATION OF EACH ALTERNATIVE)

COVER TYPE	ALTERNATIVE				
	EXISTING (A)	B	C	D	E
Hiding	3,527	2,266	2,638	2,611	2,841
Thermal	2,498	1,348	1,680	1,609	1,883

Action Alternatives B, C, D, and E

Under the action alternatives, thermal and hiding cover would be removed in the stands that were entered *(see Table IV-13)*. The removal of canopy cover would increase forage production. Prescribed burning would further stimulate understory forage production and shrub sprouting. Road densities would increase for a short duration due to the proposed temporary road. The corridor between Unit 11 and Unit 15 may be too narrow (600 feet) to provide an effective travel corridor, as is the corridor dividing Units 2, 5, and 6 from Units 1 and 7. However, big game movement, as a whole, is not impeded through the project area.

Cumulative Effects

Forest management on PCTC lands is resulting in increased forage at the expense of cover. Some of these openings are too large to allow big game to use the entire unit. On State trust lands, harvest units are smaller and allow more effective use of the forage resources produced. The proposed prescribed burn on USFS lands are expected to increase summer forage at the expense of cover.

No-Action Alternative A

Under the No-Action Alternative, canopy cover in the area would continue to increase, resulting in more hiding and thermal cover and decreased forage production on State trust lands.

Action Alternative B, C, D, and E

Under the action alternatives, hiding and thermal cover would be removed from more area; however, this is expected to produce minimal effects due to the interspersion of unharvested areas.

ROADS

A detailed description of the background and existing road condition in the project area is in Chapter III. The Lower Whitefish and Lower Jellison roads have been recently reconstructed and presently meet or exceed minimum BMPs. If an action alternative were selected, both roads would require minimal improvement work to ensure all drainage features are adequate for the duration of the project activities. As described in Chapter III, Werner Peak Road would require extensive maintenance and repair work before minimum BMPs would be met. *(SEE THE Alternative Maps in Chapter II for locations of the road segments.)*

DIRECT AND INDIRECT EFFECTS

No-Action Alternative A

If Alternative A were chosen, the road improvement package would not be implemented. The following direct and indirect effects would likely occur on Werner Peak Road:

- Existing roads would remain in their current condition.
- Standards would remain the same or continue to deteriorate.
- Werner Peak Road would continue to be a source of sediment delivery to

perennial streams that flow into Swift Creek.

- The existing level of maintenance and emergency repairs would not be sufficient to meet minimum BMPs.
- The vertical and horizontal alignment of the road would not change; therefore, sight distance around curves would still be limited.
- A few additional turnouts may be incorporated during maintenance activities, but overall safety would be minimally improved.
- Roads would continue to depreciate in value; maintenance and emergency-repair costs to keep the road functional would probably increase .

Common to Action Alternatives B, C, D, and E

Under all action alternatives, the following road segments with specified improvements are proposed (the expected effects follow):

Lower Jellison Road - One mile of the existing road and one mile of existing access spur.

- Replace a culvert that is too short to accommodate surface blading.
- Improve surface drainage by constructing drive-through drain dips.
- Clear encroaching vegetation from the access spur by surface blading.

Lower Whitefish Road - Two miles of road in the project area.

- Replace 2 culverts that are not adequately designed to address peak flows in 100-year storm events.
- Improve ditched road segments before and after harvesting.
- Improve existing drive-through dips where necessary.
- Blade road surface following harvesting activities.

Werner Peak Road - Reconstruction would be required on 4.1 miles of this road to raise it to secondary road standards and meet BMPs. An additional 1-mile segment to Werner Peak Lookout would need minor improvements and BMP work.

- Increase sight distance for safety by brushing and clearing the right-of-way along the sides of the road. Brushing and clearing would be increased to 8 feet from the edge of the road.
- Replace numerous culverts with larger culverts to allow for surface blading and 100-year storm events.
- Install and maintain sediment-control fences where wet pipes (culverts on stream crossings) are installed.
- Replace ditch-relief culverts that are no longer functional.
- Install a combination of rubber flappers and rollover dips to reduce road-surface runnoff.
- Pull ditch to accommodate road surface runoff.
- Reconstruct road segments with slumping or outsloped edges to improve safety.
- Construct safety turnouts.

Temporary Spur off Werner Peak Road - Approximately 1,700 feet of temporary road would be constructed to improve access and reduce logging costs in Unit 1. Unit 1 is located in Section 33 and may be viewed in the Chapter II Alternative Maps.

- Build the temporary road to minimum standards; the road would be used only during the harvesting of Unit 1.

- Rip, grass seed and block the road following the completion of logging to prevent access. This area would be included in the planting program when the rest of the unit is planted.

The following direct and indirect effects from road improvements would likely occur on all roads within the project area:

- Short-term sediment delivery would be increased during and immediately after road construction, but would decrease in the long term.
- Safety would improve due to increases in sight distances and number of passing turnouts.
- The initial investment would improve long-term road maintenance by reducing costly road upkeep.
- Short-term closures during road construction activities may cause short periods of delay.
- Improved access would result in the roads being more accessible for public use.

CUMULATIVE EFFECTS COMMON TO ALL ALTERNATIVES

The slow spread of noxious weeds would be a cumulative effect of other adjacent activities, such as recreation and woodcutting. This would probably continue to increase over time as more people live and recreate in the Flathead area.

CUMULATIVE EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Improved roads would increase the amount of use and, possibly, pique interest in leasing Werner Peak Lookout as a recreational facility (overnight shelter for recreation).

ECONOMICS

METHODS

The basic method for the economic analysis is the nondiscounted cash flow. The cash-flow analysis tries to estimate the flow of revenue and costs from the different treatments that are related only to this project. No future activities are included due to the fact that projecting treatments into the future is uncertain due to changes in policies, markets, personnel, and natural events. The analysis estimates the cash flow from timber harvesting and nonadministrative costs for the alternatives considered. DNRC does not have a formal accounting system to track costs for individual projects from start to finish. A cash-flow analysis of DNRC's forest-product sales program is conducted annually. The results from previous years is in Chapter III.

The results of the nondiscounted cash-flow analysis appear in *Table IV-18 through Table IV-19*.

ASSUMPTIONS - ALL ALTERNATIVES

The following assumptions were used to estimate the revenue and nonadministrative costs for each alternative:

- Costs, revenues, and estimates of return are estimates intended for relative comparison of alternatives. They are not intended to be used as absolute return values.
- The harvest volumes for the alternatives were based on estimates made by Stillwater Unit personnel.
- The stumpage price was estimated using the residual value (RV) approach. The estimated stumpage value equals the delivered log prices, minus cost and an amount for profit and risk. Costs include

logging, hauling, forest improvement, and development. The amount for profit and risk was based on 15% of the logging and haul costs. Profit and risk is the return to the timber buyer that accounts for actual time and effort, some profit for entrepreneurial spirit, and something to cover the expected losses on an occasional sale that in not profitable for the purchaser.

- The estimated delivered log price was based on the Montana Sawlog and Veneer Log Price Report (based on a survey of mills, October-December 1998) from Bureau of Business and Economic Research, University of Montana. The average sawlog price from Region 2 Western Montana for grand fir was used.

- Stillwater Unit personnel estimated the logging costs. The estimates for logging costs by logging method used were:

  - $310 per MBF for helicopter,
  - $150 per MBF for cable/soft-track or low-ground-pressure equipment, and
  - $85 per MBF for conventional tractor skidding

TABLE IV-14 - PERCENT OF ACRES BY ALTERNATIVE AND HARVEST SYSTEM

LOGGING SYSTEM	ALTERNATIVE				
	A	B	C	D	E
Helicopter	0	26	0	20	0
Cable/soft track	0	24	33	27	33
Conventional tractor	0	49	67	53	67

- Hauling costs were estimated based on the following equation: *hauling cost = 1.056*(5.5494+.5656 * paved hauling distance + .9820 * unpaved hauling distance + .4787 * average logs per thousand [Mike Niccolucci Personal Communication 1996]).*

- Stillwater Unit and NWLO personnel estimated development costs for each alternative. The development cost for this project for all alternatives is estimated to be $169,996. Development costs for this proposal are the estimated costs of road reconstruction, new road construction, road obliteration, and watershed improvements that would provide access to the State trust lands involved and improve water quality on State trust lands. The purchaser is required to do the work as part of the contract. Development costs are subtracted from the delivered log value in order to estimate stumpage value.

- The FI fee is based on programwide costs and the cost to maintain the ongoing staffing, treatment stands, maintenance of roads for the current year, and acquisition rights-of-way. Money collected under FI from a purchaser provides the funding for the State to accomplish projects such as tree planting, site preparation, slash treatment, thinning, road maintenance, right-of-away acquisitions, and some timber-sale-related activities. Thus, DNRC is able to improve the long-term productivity of timber stands on State trust lands and maintain or acquire access for future revenue-producing projects. The current FI fee for NWLO is $46.41 per MBF.

- The sale-specific forest-improvement (SSFI) costs are the current cost estimates for the amount and types of treatments (site preparation, hazard reduction, planting, etc.) planned for each of the alternatives being considered. Funding to complete these projects will be collected from current or future timber sales, depending upon the timing of the treatments. These projects are funded with the FI fee ($46.41 per MBF), which is collected from timber harvest projects.

  The SSFI costs are based on the

following costs:

- broadcast burn - jackpot burning = $15.20 per acre;
- broadcast burn - helicopter units = $75.10 per acre;
- broadcast burn - broadcast burning = $135 per acre;
- excavator site preparation = $95 per acre;
- excavator site preparation 20-55% slope = $130 per acre;
- dozer-site preparation = $65 per acre;
- full planting = $93.19 per acre (221.9 TPA * $0.42 per tree);
- interplanting = $69.00 per acre (150 TPA * $0.46 per tree); and
- planting helicopter units = $110.00 per acre.

Some of these projects may be delayed due to weather or future budget constraints.

- The estimated total timber dollar return to the trust is the estimated stumpage price (winning bid price $/MBF) multiplied by the estimated harvest volume.
- The estimated total timber dollar amount collected by the State (total revenue) is FI costs, plus the estimated stumpage price, multiplied by the estimated harvest volume.

Costs related to the administration of the timber sale program are tracked only at the Land Office and Statewide level. DNRC does not have a formal accounting system to keep track of costs for individual timber sales.

DNRC has a sustained-yield volume level of 42.164 MMBF per year Statewide. If DNRC does not select the highest volume alternative in this project, a relative amount of timber would likely be sold and harvested on State trust land elsewhere.

Currently, DNRC is generating revenue by leasing Werner Peak Lookout for skiing and snowboarding. This lease started the winter of 1998/1999 and generates $1,000 per year. Also, a portion of the roads in the project area is part of a

TABLE IV-15 - SALE-SPECIFIC ACRES BY TREATMENT AND ALTERNATIVE - NONBURNING

ALTERNATIVE	FULL PLANT	INTERPLANT	PLANTING HELICOPTER UNIT	SITE PREPARATION/SCARIFICATION		
				DOZER PILE	MODERATE EXCAVATOR	STEEP EXCAVATOR
B	144	217	178	34	129	143
C	144	217	0	34	129	131
D	144	163	130	34	129	71
E	144	163	0	34	129	59

TABLE IV-16 - SALE-SPECIFIC ACRES BY ALTERNATIVE AND TREATMENT - BURNING

ALTERNATIVE	JACKPOT BURNING	BROADCAST BURNING	BURNING HELICOPTER UNITS
B	435	472	355
C	423	472	0
D	363	341	213
E	351	341	0

TABLE IV-17 - SALE-SPECIFIC FOREST-IMPROVEMENT COST ($) BY ALTERNATIVE AND METHOD

	ALTERNATIVE				
	A	B	C	D	E
Burning - jackpot	-	6,612	6,430	5,518	5,335
Burning - broadcast	-	63,720	63,720	46,035	46,035
Burning - helicopter units	-	26,661	-	15,996	-
Full plant	-	13,392	13,392	13,392	13,392
Interplant	-	14,973	14,973	11,247	11,247
Plant helicopter units	-	19,580	-	14,300	-
Site preparation - dozer pile	-	2,210	2,210	2,210	2,210
Site preparation - moderate excavator ground	-	12,255	12,255	12,255	12,255
Site preparation - steep excavator ground	-	18,590	17,030	9,230	7,670
Total costs	-	177,993	130,010	130,183	98,144
Total burning costs only	-	96,993	70,150	67,549	51,370
Total nonburning costs only	-	81,000	59,860	62,634	46,774
FI collected by alternative		252,795	186,383	171,485	137,188
SALE-SPECIFIC FOREST-IMPROVEMENT COSTS ($) PER MBF BY ALTERNATIVE					
Total cost per MBF	0	33	32	35	33
Burning cost only per MBF	0	18	17	18	17
Nonburning costs per MBF	0	15	15	17	16

TABLE IV-18 - ESTIMATED STUMPAGE VALUE ($) PER MBF BY ALTERNATIVE

RV APPRAISAL ASSUMPTIONS (PER MBF)	ALTERNATIVE				
	A	B	C	D	E
Delivered log prices	0	334	334	334	334
Logging costs	0	160	106	147	107
Haul costs		35	35	35	35
Development costs ($169,996 divided by alternative volume)	0	31	42	46	58
Forest improvement	0	46	46	46	46
Profit and risk	0	29	21	27	21
Estimated stumpage value	0	32	83	32	67

Land Use License that provides snowmobile-tours in the winter.

Limitations of the economic analysis:

- Only known costs and benefits associated with the activities listed below are considered.
- No potential benefits associated with leaving trees (i.e. snag recruitment, structural diversity, aesthetics, wildlife habitat, nutrient recycling, etc.) are considered.

ESTIMATED DIRECT REVENUE FROM ALTERNATIVES CONSIDERED

Direct Effects of Alternatives A, B, C, D AND E on Jobs and Income

The impacts on local communities are estimated by quantifying jobs and income associated with harvesting and processing the timber into final products. Regional response coefficients estimated for northwestern Montana indicate that timber harvesting provides 10.58

TABLE IV-19 - COSTS AND BENEFITS ASSOCIATED WITH THIS PROJECT BY ALTERNATIVE

	ALTERNATIVES				
	A	B	C	D	E
1. Estimated total harvest volume (MBF)	0	5,447	4,016	3,695	2,956
2. Development cost ($/MBF)	$0	$31	$42	$46	$58
3. Estimated stumpage value ($/MBF)	$0	$32	$83	$32	$67
4. Forest improvement ($/MBF)	$0	$46.41	$46.41	$46.41	$46.41
5. Estimated stumpage value, FI, and development cost ($/MBF) (Line 2 + line 3 + line 4)	$0	$109.41	$171.41	$124.41	$171.41
6. Total timber dollar value based on estimated stumpage value, FI cost, and development cost multiplied by the estimated harvest volume (line 5 * line 1)	$0	$595,956	$688,383	$459,695	$506,688
7. Estimated stumpage value and FI ($/MBF) (line 3 + line 4)	$0	$78.41	$129.41	$78.41	$113.41
8. Total timber dollar revenue to the State (estimated stumpage value + FI cost multiplied by estimated harvest volume) (line 7 * line 1)	$0	$427,099	$519,712	$289,725	$335,240
9. Total timber dollar return to the trust (line 1 * line 3; does not include administration costs)	$0	$174,304	$333,328	$118,240	$198,052
10. Total dollar gross revenue from lease in the project area	$1,000	$1,000	$1,000	$1,000	$1,000
11. Total dollar SSFI costs *(Table IV-17 - Total of costs)*	$0	$177,993	$130,010	-$130,183	$98,144
12. SSFI Costs ($/MBF) (line 11/line 1)	$0	$33	$32	$35	$33

direct jobs per MMBF, and a total direct income of $337,146 (Keegan et al.) for an average annual income of $31,866.35 per job.

It is important to note that the response coefficients are an accounting of what has happened historically. These response coefficients are average values and not marginal values. To say the consequence of not selling this sale would result in the loss of XX would have to be done in order to be more certain that there would be a reduction in income and employment. Lack of a marginal analysis and the use of average numbers commonly results in an overestimation of the total economic effects (Godfrey and Beutler 1993).

Cumulative Effects of All Alternatives

The last survey of Montana's forest products industry was done in 1994 (Keegan et al 1995). *Table IV-20* describes the cumulative effects of wood supply to the regional forest

TABLE IV-20 – CUMULATIVE EFFECTS OF WOOD SUPPLY TO REGIONAL FOREST PRODUCT INDUSTRIES

COUNTY	[1]ANNUAL CAPACITY OF LOCAL MILLS (MMBF)	[2]CONTRIBUTION (BY PERCENT) TO LOCAL MILL VOLUME (ANNUAL CAPACITY)					
		NWLO (DNRC) ANNUAL TARGET OF 22 MMBF	ALTERNATIVE				
			A (NO ACTION)	B	C	D	E
Lincoln	144	15%	0%	4%	3%	3%	2%
Flathead	279	8%	0%	2%	1%	1%	1%
[3]Lake/Mineral/Sanders	180	12%	0%	4%	2%	2%	2%
All Counties	603	4%	0%	1%	1%	1%	1%
Lincoln & Flathead Combined	423	5%	0%	1%	1%	1%	1%

[1]Mill Capacity was reduced by 10% to reflect recent reduction in capacity. (personal communication with Chuck Keegan 1999).

[2]Based upon NWLO's harvest history, it is unlikely that all of the State timber sale would stay in one county. In most cases, State wood is distributed to mills throughout several counties, therefore, the contribution of sale volumes to "All Counties" is the most likely effect of NWLO sales. If an action alternative was selected, the sale volume would likely stay in Lincoln and/or Flathead County and direct effects of the sale would be on the capacity in those 2 counties.

[3]Additional timber sale volume from DNRC's Southwest Land Office was not included in this analysis for the northwest portion of the State. Had those figures been included, DNRC's timber volume contribution to Mineral County would have been higher.

products industry. The long-term impacts are difficult to assess given today's global markets. The importance of State timber sales to the regional economy is dependent upon the wood supply originating on USFS, private nonindustrial, private industrial, and tribal lands.

The following mill capacity estimates are from Montana's Forest Products Industry "A Descriptive Analysis" 1969-1994. Keegan et al. 1995. Bureau of Business and Economic Research, University of Montana, Missoula, MT.

In Lincoln and Flathead Counties, the proposed Chicken/Werner timber sale represents approximately 1% of the forest products capacity and processing for a single year. The estimates of local wood products processing were similar to mill capacity and are located in the project file at Stillwater Unit.

WATERSHED

The primary effect of forest-management practices on water quality is sediment delivery to streams. Sediment is generated by road construction and use, especially from roads constructed along or across streams. Timber harvesting in or near riparian areas can also reduce the filtering capacity normally provided by vegetation in these areas. Limited harvesting may occur in an SMZ, but with the implementation of 165-foot fisher buffers, in accordance with the SFLMP, the acreage would be very small. The harvesting activities proposed in all timber harvesting alternatives would fully comply with BMPs and the Montana SMZ Law and rules to minimize the risk of increased sedimentation from harvest units. No harvesting would occur in an SMZ of a stream containing bull trout. DNRC has agreed to implement the immediate actions for bull trout restoration recommended by the Governor's Bull Trout Restoration Team. The width and retention requirements of the SMZ Law would be exceeded through the implementation of the fisher guidance.

METHODS

The methodology used to determine the potential impacts to water quality of the proposed project consists of assessing changes or improvements to existing sediment sources identified through field reconnaissance and addressing the impacts of new activities that could, potentially, affect water quality.

ANALYSIS AREA

The analysis area for assessing the potential water-quality impacts from the project proposal will be the project area and all roads proposed for hauling, both inside and outside of the project area.

DIRECT AND INDIRECT EFFECTS

No -Action Alternative A

Under Alternative A, the No-Action Alternative, no new roads would be constructed and no timber would be harvested. No new water-quality impacts would be generated in the watersheds considered in the proposal beyond those already occurring due to natural processes or past management. None of the proposed stream-crossing replacements or road improvements would be completed under this alternative. These problems would continue to recover or degrade as dictated by natural and preexisting conditions until funding sources become available to repair them.

Common to Alternatives B, C, D and E

Each of these alternatives would repair Werner Peak Road from its origin at Lower Whitefish Road to the lookout. This repair work would consist of adding surface drainage features at regular intervals, installing ditch-relief culverts where needed, and replacing numerous stream and draw crossings. The road is eroding from a lack of surface drainage and ditch-relief structures; this proposal would relieve erosion and substantially reduce the amount of sediment generated from the road. The draw-crossing replacements would occur at sites where the pipe is not properly designed; pipes would be installed in some areas where, currently, there are none. Installation of these structures would relieve potential sources of sediment and reduce the potential for the crossing to fail.

There are 2 stream crossings on Lower Whitefish Road; one in Section 19 and the other 1/2 mile northwest of the project area. The existing pipes are too small in diameter, not long enough, and directly deliver surface runoff to the crossing. Longer pipes with a larger diameter would replace the existing culverts

and accommodate a 100-year magnitude flood event. Lengthening the culverts would allow for proper pipe installation and placement of slash filter windrows to minimize sediment delivery to the stream. The new crossings would be designed with a roll-in grade over the pipe to prevent direct delivery of surface runoff.

Approximately 0.3 miles of temporary road would be constructed to access proposed harvest units in each of these alternatives. This road would be located in Section 33 of the proposed project area and would not be located near a stream, draw, or SMZ. The road, designed to the minimum standard, would incorporate all applicable BMPs. This temporary road would be used for the duration of the harvesting activities within the proposed unit and be reclaimed once activities were completed. Since the road would be located well away from any stream or draw and would incorporate all applicable BMPs and erosion control measures, the impacts to water quality would be low risk.

The proposed projects listed above would be completed using all applicable BMPs and in accordance with the SMZ Law and rules. During the period of operation and the next 1 to 2 years, the risk of sediment delivery would be increased due to the exposure of bare soil. This risk would be minimized through implementation mitigation measures, such as sediment fences, slash-filter windrows, and prompt seeding of the disturbed sites concurrent with operation. Once the sites revegetate, there would be a net improvement over the existing condition by eliminating existing sediment sources and reducing the possibility of road failure on several sites.

Alternative B

In addition to the effects described above, Alternative B would harvest approximately 1,262 acres of timber in the proposed project area. Of these acres, 495 would be yarded using a cable system or a helicopter. Conventional ground-based skidders would be used on approximately 541 acres; the remainder would be skidded using a low-pressure, soft-tracked skidder. This piece of equipment generates, roughly, 25% of the ground disturbance of a conventional tractor or rubber-tired skidder. All of these proposed harvest units are located well away from live streams. Provided skid trails have all appropriate BMPs applied, the risk of impacts to water quality would be low.

Alternative C

This alternative would harvest timber from approximately 895 acres in the proposed project area, and complete the roadwork described under Effects Common to Alternatives B, C, D, and E, above. Cable yarding would be used on 128 acres; the remainder would be yarded with ground-based machinery. Acres yarded with conventional ground-based equipment and soft-tracked skidders would be the same as Alternative B. As with Alternative B, units in Alternative C would be located well away from creeks and draws; the risk of impacts to water quality from the proposed harvesting would be low.

Alternative D

Alternative D would harvest timber from 917 acres in the proposed project area. Cable and helicopter systems would be used to remove timber from 353 acres; the remaining 564 acres would be ground skidded. Approximately 143 of the ground-skidded acres would use a low-pressure soft-tracked system, which generates approximately 25% of the ground disturbance of conventional tractors and rubber-tired skidders. All proposed harvest units would be located well away from streams and draws; applicable BMPs and the SMZ Law would be implemented. The risk of adverse impacts to water quality from Alternative D would be low.

Alternative E

Alternative E includes harvesting on 692 acres in the proposed project area. Approximately 128 acres would be yarded with a cable system, which would create minimal ground disturbance. The remaining acres would be skidded with ground-based equipment. The acres logged with soft-tracked and conventional equipment would be the same as those discussed under the effects of Alternative D. As with Alternative D, units in Alternative E would be located well away from creeks and draws. The risk of impacts to water quality from the proposed harvesting would be low.

CUMULATIVE WATERSHED EFFECTS

The cumulative effects of the proposed project are considered to determine if the activities, when combined with other past management, would put the watershed at risk. The proposed activity alone may not be detrimental to watershed health, but has the potential for adverse impacts when combined with past activities.

Methods

The potential watershed cumulative effects of the alternatives were determined using the PC version of the R1WATSED model developed by Region 1 of USFS. WATSED estimates the increase in water yield caused by the removal of live trees using the ECA method. This model also estimates sediment production and delivery resulting from road construction and timber harvesting. WATSED is limited in its estimates of sediment routing because it does not account for sediment generated from the bed and banks of a stream adjusting to increases in water yields. All modeling results are estimates based on empirical formulas and should be used for comparison of alternatives rather than as actual values.

Analysis Area

The Lower Swift Creek watershed is the analysis area used to assess the cumulative watershed impacts. This watershed consists of the main stem of Swift Creek and numerous first- and second-order tributaries. This watershed is large enough to capture the impacts of the proposal as well as the impacts of other activities, yet it is not so large that the impacts of this proposal are too small to be detected. This information from the Lower Swift Creek watershed will also be put into a weighted average with the other 4 subwatersheds in Swift Creek to determine if the proposed project would put the Swift Creek watershed over its recommended threshold of concern. A qualitative assessment of the first- and second-order watersheds in the proposed project area will also be considered. *(See Watershed Map in Chapter III, FIGURE III-14.)*

Common to All Alternatives

The USFS Flathead National Forest (FNF) is planning a prescribed burn south of the project area after 1999 that is estimated to cover approximately 80 acres. The burn, located on the upper portion of the ridge near Werner Peak Lookout where canopy closure is currently 50%, would generate, roughly, 10 ECA by killing about 30% of the canopy cover on the site. The burn would not take place near any live stream or draw. Should the burn escape its boundary, additional ECA would be generated beyond the above estimate.

PCTC is also conducting ongoing timber management on its ownership. In addition to the 1999 timber harvesting, PCTC is also planning to harvest trees from 38 acres in 2000. No proposed activities would put the Lower Swift Creek watershed over its recommended threshold of concern.

Alternative A

Alternative A, the No-Action Alternative, would generate no cumulative watershed impacts beyond those under current management. Current water yield increases (WYI) and ECA levels for each watershed in the project area are listed in *Table IV-21* under Alternative A. Under this alternative, these values would remain at or near present levels and would continue to decline as past harvest units continue to regenerate and move closer to predisturbance levels of water use and snowpack distribution.

Alternative B

Alternative B would harvest timber from 1,262 acres in the Lower Swift Creek watershed and construct 0.3 miles of temporary road to access Unit 1. Harvest prescriptions would range from modified clearcut with reserves to thinning and understory removal. These proposed activities would generate approximately 607 ECA and would raise the water yield from its current level of 4% over natural to 5% over natural *(see Table IV-21)*. The water yield increases include all activities on other ownerships in the watershed, listed under Cumulative Watershed *Effects Common to All Alternatives*. The combination of these proposed activities would not put the Lower Swift Creek watershed over its recommended threshold of concern for water-yield increases, nor would they put the entire Swift Creek watershed over its threshold.

WATSED indicates Alternative B would generate some potential increase in sediment yield. The potential for these increases would return to preharvest levels in about 3 years. The potential increased sediment yield predicted by WATSED would, primarily, result from the use of conventional ground-based yarding methods.

Alternative C

Alternative C would harvest timber from 895 acres in the Lower Swift Creek watershed and construct 0.3 miles of temporary road to access Unit 1. Harvest prescriptions would range from modified clearcut with reserves to thinning and understory removal. These proposed activities would generate approximately 441 ECA and raise the water yield from its current level of 4% over natural to 5% over natural *(see Table IV-21)*. The water yield increases include all activities on other ownership in the watershed, listed under *Cumulative Watershed Effect Common to All Alternatives* . The combination of these proposed activities, including the activities on other ownerships, would not put the Lower Swift Creek watershed over its recommended threshold of concern for water yield increases, nor would they put the entire Swift Creek watershed over its threshold.

WATSED indicates Alternative C would generate some potential increase in sediment yield. The potential for these increases would return to preharvest levels in about 3 years. The potential increased sediment yield predicted by WATSED would result primarily from the use of conventional ground based yarding methods.

Alternative D

Alternative D would harvest timber from 917 acres in the Lower Swift Creek watershed and construct 0.3 miles of temporary road to access Unit 1. Harvest prescriptions would range from modified clearcut with reserves to thinning and understory removal. These proposed activities would generate approximately 542 ECA and would raise the water yield from its current level of 4% over natural to 5% over natural *(see Table IV-21)*. The water yield increases include all proposed activities on other ownership in the watershed. The combination of these proposed activities, including the activities

TABLE IV-21 - COMPARISON OF WATSED-PREDICTED WATERSHED EFFECTS BY ALTERNATIVE					
	ALTERNATIVE				
	A	B	C	D	E
Acres harvested	0	1,262	895	917	692
Miles of road construction	0	0.3	0.3	0.3	0.3
ECA generated	0	607	441	542	401
Cumulative ECA[1]	2,284	2,892	2,726	2,827	2,685
Allowable ECA	3,440	3,440	3,440	3,440	3,440
Lower Swift Creek % WYI	4	5	5	5	5
Swift Creek % WYI	6	6	6	6	6
Allowable % WYI	8	8	8	8	8

[1]All values based on projection year 2000
[2]Swift Creek values generated by calculating a weighted average of water-yield increases from East Fork Swift, West Fork Swift, Chicken/Bear Paw, Antice/Johnson, and Lower Swift watersheds.

listed under Cumulative Watershed Effects *Common to All Alternatives*, would not put the Lower Swift Creek watershed over its recommended threshold of concern for water yield increases, nor would they put the entire Swift Creek watershed over its threshold.

WATSED indicates Alternative D would generate some potential increase in sediment yield. The potential for these increases would return to preharvest levels in about 2 years. The potential increased sediment yield predicted by WATSED would result primarily from the use of conventional ground-based yarding methods.

Alternative E

Alternative E would harvest timber from 692 acres in the Lower Swift Creek watershed and construct 0.3 miles of temporary road to access Unit 1. Harvest prescriptions would range from modified clearcut with reserves to thinning and understory removal. These proposed activities would generate approximately 401 ECA and would raise the water yield from its current level of 4% over natural to 5% over natural *(see Table IV-21)*. The water yield increases include all proposed activities on other ownership in the watershed. The combination of these proposed activities, including the activities listed under Cumulative Watershed Effects Common to All Alternatives, would not put the Lower Swift Creek watershed over its recommended threshold of concern for water-yield increases, nor would they put the entire Swift Creek watershed over its threshold.

WATSED indicates Alternative E would generate some potential increase in sediment yield. The potential for these increases would return to preharvest levels in about 2 years. The potential increased sediment yield predicted by WATSED would result primarily from the use of conventional ground-based yarding methods.

FISHERIES

If timber harvesting and associated activities, such as road construction and reconstruction, are not conducted with the proper mitigation measures, there is potential to add sediment to creeks. Sediment added over time has the potential to affect bull trout and other salmonids by degrading the gravel used for spawning and rearing habitat. The cumulative impacts to fish habitat and bull trout are very similar to the cumulative impacts to the watershed.

Analysis Methods

The methods used to evaluate the potential impacts of the proposed project to bull trout populations will be, primarily, the same as those used to evaluate the watershed effects. Other impacts to bull trout listed in Chapter III are administered by the DFWP and are not under the control of DNRC.

Analysis Area

The analysis area used to assess the potential cumulative impacts of the proposed project area to bull trout will consist of the Lower Swift Creek watershed and all tributaries located within the proposed project area.

Direct, Indirect, and Cumulative Effects to Bull Trout and Westslope Cutthroat Trout

Common to All Alternatives

FNF is planning a controlled burn near the proposed project area within the Lower Swift Creek watershed to restore whitebark pine stands near the ridgetop. PCTC is planning ongoing timber harvesting on its land within the Lower Swift Creek watershed. A more detailed description of these projects and their anticipated impacts to water quality are referenced in the watershed section. Since neither of these projects would contribute cumulative watershed impacts beyond a recommended threshold of concern, there is a low risk of adverse cumulative impacts to bull trout or westslope cutthroat trout as a result of these proposals.

Alternative A

Fisheries habitat condition would remain essentially unchanged. Existing and potential sources of erosion and fine sediment would be left in their current condition and continue to improve or degrade as dictated by natural and preexisting conditions. Monitoring of fisheries habitat by DNRC would be discontinued for the main stem of Swift Creek until future projects present the need for additional data.

Alternatives B, C, D and E

The impacts of the proposed project to bull trout and westslope cutthroat trout are closely related to the effects to the watershed. The proposed project would harvest timber from between 692 and 1,262 acres, depending on the alternative. None of the proposed harvest units would be within 25 meters (approximately 82 feet) of an intermittent stream, or within 50 meters (approximately 164 feet) of a perennial stream. As discussed in the watershed section, several miles of the existing Werner Peak Lookout Road would be improved to meet current BMP standards, and 10 existing stream and draw crossings would be replaced. The existing crossings are not properly designed and represent a potential risk to water quality and fish habitat if they were overtopped by a high runoff event. The road reconstruction activities may produce short-term increases in fine sediment to the Swift Creek tributaries during the period of operation. With proper mitigation measures in place during and after the reconstruction period, the risk of fine sediment reaching Swift Creek is low and,

over time, would decrease as bare soil revegetated. The proposal could lead to a long-term reduction in fine-sediment contribution to bull trout spawning gravel for the following reasons:

- Improvement of the existing Werner Peak Lookout Road would substantially reduce the amount of fine sediment eroded and delivered to draw crossings.

- Several existing and potential sources of sediment at stream crossings would be replaced with properly designed structures that meet all current applicable BMPs.

Over time, sediment-source reduction through implementations of BMPs would likely improve spawning habitat in the Swift Creek drainage.

SOILS

Timber harvesting and related activities have the potential to affect soil productivity. Ground-based skidding and site preparation can displace fertile layers of topsoil, exposing less productive subsoil layers. Compaction of soils in skid trails also has the potential to decrease soil productivity. Road construction also creates compaction and displacement of soils, effectively removing that area from productivity.

Analysis Methods

As a result of the proposed project, the anticipated cumulative effects to soil productivity were analyzed by estimating the acreage in proposed harvest units trafficked by skid trails. The area of skid trails in an impacted condition (compaction and/or displacement sufficient to decrease productivity) is then estimated as a percentage of total skid-trail acreage. Monitoring by DNRC and USFS showed that ground-based logging activity generates moderate to severe compaction and displacement on 7.5% to 10% of the ground trafficked, and that approximately 20% of ground-based logging units are trafficked by skid trails *(SFLMP Final EIS, 1996)*.

Analysis Area

The analysis area for assessing the cumulative impacts to soil productivity consists of the proposed project area. The potential impacts to the soil resource would not stretch beyond the boundary of this project proposal. Areas proposed for harvest that overlap past timber harvesting would have the highest risk of cumulative impacts.

Direct, Indirect, and Cumulative Effects to Soils Productivity

Alternative A

With Alternative A, the No-Action Alternative, some continued effects to soil resources by erosion on open roads and skid trails with inadequate drainage would occur.

Alternatives B, C, D, and E

For all timber-harvesting alternatives, precautions would be taken to reduce soils impacts from the construction of temporary roads, skidding, and mechanical site preparation. Mitigation measures are listed below. The area of detrimental soil impacts would be limited to less than 15% of the harvest units to maintain long-term soil productivity.

Yarding timber by helicopter and cable would have negligible effects on soil productivity and erosion, assuming that slash would be left on site for nutrient cycling. Landings for helicopters would be larger than those typically used for ground-based yarding, but landings would be more widely spaced than those used with conventional yarding methods and would be located on moderately sloped, well-drained sites *(see Appendix A - Stipulations and*

TABLE IV-22 - SUMMARY OF EFFECTS OF TIMBER HARVEST ALTERNATIVES ON SOILS

	ALTERNATIVES				
	A	B	C	D	E
Acres of harvest	0	1,262	895	917	692
Acres of helicopter yarding	0	495	128	353	128
Acres of tractor yarding[1]	0	667	667	564	564
Acres of skid trails[2]	0	134	134	113	113
Acres of ground-based site preparation	0	667	667	564	564
Maximum acrs soil impacted[3]	0	114	114	97	97
Percent of harvest unit surface impacted	0	9	13	11	14

[1]This includes both conventional ground-based equipment and low-pressure yarding equipment.
[2]15 to 20% of ground-based harvest units.
[3]7.5 to 10% of skid trails and less than 15% of machine-piled area.

Specifications under Soils).

Ground-based skidding with rubber-tired skidders, tractors, or clippers are the most economical methods of timber harvesting on well-drained soils of moderate slope. Skidders and tractors have a higher risk of affecting soils through displacement, compaction, and area of disturbance. Main skid trails can become compacted and reduce the long-term productivity of the site unless remedied. Soft-track skidders are specialized tractors that cause less displacement and compaction than conventional ground-based yarding equipment. These can be used on steeper slopes and more sensitive soils where rubber-tired skidders, tractors, or clippers cannot operate.

Slash-disposal and site-preparation operations would incorporate a combination of broadcast burning and machine piling and scarification. Piling and scarification would be completed with a dozer where slopes are gentle enough to permit. Steeper slopes would have slash treatment and site preparation done with an excavator. Excavators have greater flexibility to evenly distribute scalps for regeneration, better distribute large woody debris, and damage soils less than brush dozers. All piling and scarification would be limited to the area needed to accomplish silvicultural objectives.

Table IV-22 displays the anticipated impacts of Alternatives B, C, D, and E of the proposed project. Most of the acres proposed for ground-based harvesting were entered in the early 1950s for overstory removal harvesting. The timber in these units was skidded with tractors, and existing skid-trail spacing in these stands is approximately 200 feet. In order to limit cumulative impacts to soils, these existing trails would be used for this proposal where practical. New skid trails would be used only if the existing skid-trail layout would not meet current BMP standards. Most of the acres proposed for cable and helicopter yarding in this proposal were also harvested with ground-based machinery in the 1950s. Yarding with cable or helicopter systems would not generate any additional disturbance to the soil.

In each of these alternatives, the area proposed for ground-based skidding would use a combination of both soft-track and conventional

tractors. Some of the area listed in *Table IV-22* as tractor yarding would be completed with soft-track skidders. The acreage of soft-track skidding may be an overestimation, depending on which contractor does the work. If the contractor does not have access to a soft-track skidder, acres proposed for soft-track skidding would be yarded with a cable system; therefore, the acreage of ground disturbance could be substantially reduced from values reported in *Table IV-22*.

IRRETRIEVABLE AND IRREVERSIBLE COMMITMENTS OF NATURAL RESOURCES

IRRETRIEVABLE

According to Shipley (1995), irretrievable commitments of resources are lost for a period of time. Some stands in the project area are mature, with individual trees more than 150 years old. Any of the timber-harvesting alternatives would cause some of these large, old, live trees to be irretrievably lost; they would no longer contribute to future snag recruitment, stand-structure and compositional diversity, aesthetics, wildlife habitat, nutrient-recycling processes, or any other important ecosystem functions.

Areas that will be converted from timber production to permanent roads would be lost from timber production for a period of time and would not function as forested lands.

IRREVERSIBLE

According to Shipley (1995), irreversible commitments of resources are commitments that cannot be reversed or replaced. The initial loss of trees due to timber harvesting would not be irreversible. Natural regeneration combined with site preparation and artificial regeneration would promote the establishment of new trees. If management decisions allow for the continued growth of established trees, they would ultimately become equivalent in size to the irretrievably harvested trees.

Areas that are initially lost to timber production through road construction could, over time, be reclaimed and once again produce timber and function as forested land.

SUMMARY OF RELATIONSHIP BETWEEN SHORT-TERM AND LONG-TERM PRODUCTIVITY

Generally, short-term uses are those that occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource.

All harvest alternatives are designed to protect the long-term productivity of the sites. The stocking reduction that would occur under each action alternative would be anticipated to increase the health and growth of residual stands, resulting in increased long-term productivity. The postharvest stands would more closely resemble stands that existed historically and provide a variety of opportunities for use in the long term.

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Administrative road use
Road use that is restricted to DNRC personnel and contractors or for purposes such as monitoring, forest improvement, fire control, hazard reduction, etc.

Airshed
An area defined by a certain set of air conditions; typically a mountain valley in which air movement is constrained by natural conditions such as topography.

Appropriate conditions
Describes the set of forest conditions determined by DNRC to best meet the State Forest Land Management Plan (SFLMP) objectives. The four main components useful for describing an appropriate mix of conditions are cover type proportions, age class distributions, stand structural characteristics, and the spatial relationships of stands (size, shape, location, etc.), all assessed across the landscape.

Basal area
A measure of the number of square feet of space occupied by the stem of a tree.

Best Management Practices (BMPs)
Guidelines to direct forest activities, such as logging and road construction, for the protection of soils and water quality.

Biodiversity
The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur.

Board foot
144 cubic inches of wood that is equivalent to a piece of lumber 1-inch thick by 1-foot wide by 1-foot long.

Boreal forest
The type of forest found in the Northern Temperate Zones and Arctic region.

Canopy
The upper level of a forest, consisting of branches and leaves of taller trees.

Cavity
A hollow excavated in trees by birds or other animals. Cavities are used for roosting and reproduction by many birds and mammals.

Compaction
Increase in soil density caused by force exerted at the soil surface, modifying aeration and nutrient availability.

Connectivity
The quality, extent, or state of being joined; unity; the opposite of fragmentation.

Core area
See Security Habitat (grizzly bears).

Cover
See HIDING COVER and/or THERMAL COVER.

Co-dominant tree
A tree which extends its crown into the canopy, receiving direct sunlight from above and limited sunlight on its sides. One or more sides are crowded by the crowns of other trees.

Coarse down woody material
Dead trees within a forest stand that have fallen and begun decomposing on the forest floor.

Crown cover or crown closure
The percentage of a given area covered by the crowns of trees.

Cutting units
Areas of timber proposed for harvest.

Cull
A tree of such poor quality that it has no merchantable value in terms of the product being cut.

Discounting
In economics, a method of accounting for the value of money over time, its ability to earn interest, so that costs and benefits occurring at different points in time are brought to a common date for comparison.

Ditch relief
A method of draining water from roads using ditches and a corrugated metal pipe. The pipe is placed just under the road surface.

Dominant tree
Those trees within a forest stand that extend their crowns above surrounding trees and capture sunlight from above and around the crown.

Drain dip
A graded depression built into a road to divert water and prevent soil erosion.

Ecosystem
An interacting system of living organisms and the land and water that make up their environment; the home place of all living things, including humans.

Environmental effects
The impacts or effects of a project on the natural and human environment.

Equivalent clearcut area (ECA)
The total area within a watershed where timber has been harvested, including clearcuts, partial cuts, roads, and burns.

Allowable ECA - The estimated number of acres that can be clearcut before stream channel stability is affected.

Existing ECA - The number of acres that have been previously harvested taking into account the degree of hydrologic recovery that has occurred due to revegetation.

Remaining ECA -The calculated amount of harvest that may occur without substantially increasing the risk of causing detrimental effects to stream-channel stability.

Excavator piling
The piling of logging residue using an excavator.

Fire regimes
Describes the frequency, type, and severity of wildfires. Examples include: frequent, nonlethal underburns; mixed-severity fires; and stand-replacement or lethal burns.

Forage
All browse and nonwoody plants available to wildlife for grazing.

Forest improvement
The establishment and growing of trees after a site has been harvested. Associated activities include site preparation, planting,

survival checks, regeneration surveys, and stand thinnings; road maintenance; resource monitoring; noxious weed management; and right of way acquisition on a State Forest.

Fragmentation (forest)
A reduction of connectivity and increase in sharp stand edges resulting when large contiguous areas of forest with similar age and structural character are interrupted through disturbance (e.g., stand-replacement fire, timber harvesting).

Habitat
The place where a plant or animal naturally or normally lives and grows.

Habitat type
The place or type of site where a plant or animal naturally or normally lives and grows.

Hazard reduction
The abatement of a fire hazard by processing logging residue with methods such as separation, removal, scattering, lopping, crushing, piling and burning, broadcast burning, burying, and chipping.

Hiding cover
Vegetation capable of hiding some specified portion of a standing adult mammal from human view at a distance of 200 feet.

Historical forest condition
The condition of the forest prior to settlement by Europeans.

Intermediate trees
A characteristics of certain tree species which allows them to survive in relatively low light conditions, although they may not thrive.

Interdisciplinary team
A team of resource specialists brought together to analyze the effects of a project on the environment.

Irretrievable commitment of resources
Resources, such as harvested timber or other renewable natural resources, that are lost for a period of time. A stand of trees that is cut has been irretrievably lost (as opposed to irreversibly lost) because the stand can regenerate.

Irreversible commitment of resources
Loss of resources that cannot be reversed except perhaps in the extreme long term, such as minerals, historical or archaeological resources; or vegetation and habitat lost to permanent roads. Irreversible also refers to the loss of future options.

Landscape
An area of land with interacting ecosystems.

Mitigation measure
An action or policy designed to reduce or prevent detrimental effects.

Moving-window analysis
A computer-based method that, in this EIS, is used to quantify the area influenced by roads in a study area. Starting with the pixel in the upper left corner of the computerized subunit map, the computer calculates how many miles of road exist within a 1-square-mile "window" around that pixel. It moves to the next pixel and repeats the process until the road density is calculated in a 1-square-mile area around every pixel in the study area. The number and percentage of pixels in the study area that fall into different road density classes are then calculated by the computer. Based on research studying the effects of roads on grizzly bears, the effects of open roads are measured by the percentage of the pixels in the study area that have at least 1.0 mile of open road in the surrounding 1-square-mile window. The effects of total roads (open, gated, barricaded, bermed, but not brushed, etc.) are measured

by the percentage of pixels in the study area that have at least 2 miles of open or restricted roads in the surrounding 1-square-mile window.

Multistoried stands
Timber stands with two or more distinct stories.

Nest site area (bald eagle)
The area in which human activity or development may stimulate abandonment of the breeding area, affect successful completion of the nesting cycle, or reduce productivity. It is either mapped for a specific nest, based on field data, or, if that is impossible, is defined as the area within a ¼-mile radius of all nest sites in the breeding area that have been active within 5 years.

No-action alternative
The option of maintaining the status quo and continuing present management activities and/or not implementing the proposed project.

Nonforested area
A naturally occurring area where trees do not establish over the long term, such as a bog, natural meadow, avalanche chute, and alpine areas.

Old growth
Working definition - Old growth is defined by DNRC as stands that are 150 years and older (140 for lodgepole pine) and that exhibit a range of structural attributes associated with old age.

Conceptual definition - The term old growth is sometimes used to describe the later, or older, stages of natural development of forest stands. Characteristics associated with old-growth generally include relatively large old trees, containing a wide variation in tree sizes, exhibiting some degree of a multi-storied structure, having signs of decadence, such as rot and spike-topped structure, and containing standing large snags and large down logs.

Overstory
The level of the forest canopy including the crowns of dominant, codominant and intermediate trees.

Patch
A discrete area of forest connected to other discrete forest areas by relatively narrow corridors; an ecosystem element (such as vegetation) that is relatively homogeneous internally, but differs from what surrounds it.

Patch shape index
A system for assessing patch shape, or a number indicating this shape. The system used in this EIS was developed by McGarigal and Marks (1994). Under this system, a perfectly square patch is represented by the number 1. Circular patches are indicated with numbers less than one. The higher the number, the more complex the shape.

Potential nesting habitat (bald eagle)
Sometimes referred to as 'suitable nesting habitat', areas that have no history of occupancy by breeding bald eagles, but contain potential to do so.

Project file
A public record of the analysis process, including all documents that form the basis for the project analysis. The project file for the Beaver Lake Timber Sale Project EIS is located at the Stillwater State Forest office near Olney, Montana.

Redds
The spawning ground or nest of various fish species.

Regeneration
The replacement of one forest stand by another as a result of natural seeding, sprouting, planting, or other methods.

Residual stand
Trees that remain standing following

any cutting operation.

Road construction activities
In general, "road construction activities" refers to all the activities conducted while building new roads, reconstructing existing roads, and obliterating roads. These activities may include any or all of the following:

- road construction
- right-of-way clearing
- excavation of cut/fill material
- installation of road surface and ditch drainage features
- installation of culverts at stream crossings
- burning right-of-way slash
- hauling and installation of borrow material
- blading and shaping road surfaces

Road Improvements
Construction projects on an existing road to improve ease of travel, safety, drainage, and water quality.

Saplings
Trees 1.0 inches to 4.0 inches in diameter at breast height.

Sawtimber trees
Trees with a minimum dbh of 9 inches.

Scarification
The mechanized gouging and ripping of surface vegetation and litter to expose mineral soil and enhance the establishment of natural regeneration.

Scoping
The process of determining the extent of the environmental assessment task. Scoping includes public involvement to learn which issues and concerns should be addressed, and the depth of assessment that will be required. It also includes a review of other factors such as laws, policies, actions by other landowners, and jurisdictions of other agencies that may affect the extent of assessment needed.

Security
For wild animals, the freedom from the likelihood of displacement or mortality due to human disturbance or confrontation.

Security habitat (grizzly bears)
An area of a minimum of 2,500 acres that is at least 0.3 miles from trails or roads with motorized travel and high-intensity, nonmotorized use during the nondenning period.

Seedlings
Live trees less than 1.0 inch dbh.

Sediment
In bodies of water, solid material, mineral or organic, that is suspended and transported or deposited.

Sediment yield
The amount of sediment that is carried to streams.

Seral
Refers to a biotic community that is in a developmental, transitional stage in ecological succession.

Shade intolerant
Describes tree species that generally can only reproduce and grow in the open or where the overstory is broken and allows sufficient sunlight to penetrate. Often these are seral species that get replaced by more shade-tolerant species during succession. In Stillwater State State Forest, shade-intolerant species generally include ponderosa pine, western larch, Douglas-fir, western white pine, and lodgepole pine.

Shade tolerant
Describes tree species that can reproduce and grow under the canopy in poor sunlight conditions. These species replace less shade-tolerant species during succession. In Stillwater State Forest, shade-tolerant species generally include subalpine fir, grand fir, Douglas-fir, Engelmann spruce, and western

red cedar.

Sight distance
In the case of grizzly bears, sight distance refers to the distance at which 90 percent of a bear is hidden from view.

Silviculture
The art and science of managing the establishment, composition, and growth of forests to accomplish specific objectives.

Site Preparation
A hand or mechanized manipulation of a harvested site to enhance the success of regeneration. Treatments are intended to modify the soil, litter, and vegetation to create microclimate conditions conducive to the establishment and growth of desired species.

Slash
Branches, tops, and cull trees left on the ground following a harvest.

Snag
A standing dead tree or the portion of a broken off tree. Snags may provide feeding and/or nesting sites for wildlife.

Snow intercept
The action of trees and other plants in catching falling snow and preventing it from reaching the ground.

Spur roads
Low standard roads, constructed to meet minimum requirements for harvest-related traffic.

Stand
An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition so to be distinguishable from the adjoining forest.

Stand density
Number of trees per acre.

Stocking
The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard, which is an estimate of either the basal area or number of trees per acre required to fully use the growth potential of the land.

Stream gradient
The slope of a stream along its course, usually expressed in percentage indicating the amount of drop per 100 feet.

Stumpage
The value of standing trees in the forest. Sometimes used to mean the commercial value of standing trees.

Substrate scoring
Rating of streambed particle sizes.

Succession
The natural series of replacement of one plant (and animal) community by another over time in the absence of disturbance.

Suppressed
The condition of a tree characterized by a low-growth rate and low vigor due to competition with overtopping trees.

Texture
A term used in visual assessments indicating distinctive or identifying features of the landscape depending on distance.

Thermal cover
For white-tailed deer, thermal cover has 70% or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

For elk and mule deer, thermal cover has 50% or more coniferous canopy closure at least 20 feet above the ground, generally requiring trees to be 40 feet or taller.

Timber-harvesting activities
In general, timber-harvesting

activities refers to all the activities conducted to facilitate timber removal before, during, and after the timber is removed. These activities may include any or all of the following:

- felling standing trees and bucking into logs
- skidding logs to a landing
- processing, sorting, and loading logs at the landing
- hauling logs to a mill
- slashing and sanitizing residual vegetation damaged during logging
- machine piling logging slash
- burning logging slash
- scarification, site preparation
- planting trees

Understory
The trees and other woody species growing under a, more-or-less, continuous cover of branches and foliage formed collectively by the overstory of adjacent trees and other woody growth.

Uneven-aged stand
Various ages and sizes of trees growing together on a uniform site.

Ungulates
Hoofed mammals, such as mule deer, white-tailed deer, elk, moose, which are mostly herbivorous and many are horned or antlered.

Vigor
The degree of health and growth of a tree or stand.

Vigor Class
The following vigor classes are based on the Stillwater State Forest Stand Level Inventory.

Full vigor - The full vigor class is represented by open-grown trees. Crown closure has not occurred, and growth is optimal.

Good-to-fair vigor - Crowns are closed at least in clumps; crown lengths are greater than 50 percent in young stands and greater than 33 percent in older stands. Growth has not yet slowed greatly.

Fair-to-poor vigor - Crown ratios are poor. Growth and mortality are nearly balanced.

Very poor vigor - Stands having very poor vigor are generally in a decadent condition due to insects, disease, stagnation, suppression or old age. Mortality is likely to exceed growth.

Watershed
The region or area drained by a river or other body of water.

Water yield
The average annual runoff for a particular watershed expressed in acre-feet.

Water yield increase
An increase in average annual runoff over natural conditions due to forest canopy removal.

Windthrow
A tree pushed over by wind. Windthrows (blowdowns) are common among shallow rooted species and in areas where cutting or natural disturbances have reduced the density of a stand so individual trees remain unprotected from the force of the wind.

APPENDIX A

STIPULATIONS AND SPECIFICATIONS

The stipulations and specifications for the action alternatives were identified or designed to prevent or reduce potential effects to resources considered in this analysis. In part, stipulations and specifications are a direct result of issue identification and resource concerns. This section is organized by resource.

Stipulations and specifications that apply to operations required by and occurring during the contract period will be contained within the Timber Sale Contract. As such, they are binding and enforceable. Stipulations and specifications relating to activities, such as hazard reduction, site preparation, and planting, that may occur during or after the contract period will be enforced by project administrators.

The following stipulations and specifications are incorporated to mitigate effects on resources involved with the action alternatives considered in this proposal.

WATERSHED AND FISHERIES

- Planned erosion-control measures include graveling portions of roads, constructing slash-filter windrows, and planting grass seed. Details for these control measures will be included in Appendix B of the Timber Sale Agreement.
- SMZs will be delineated where they occur in harvest areas to maintain water quality and protect areas adjacent to streams.
- Culvert sizing for all road projects will be as recommended by the DNRC hydrologist.
- Stream crossings, where culvert replacements are necessary, will have the following requirements, as needed, to meet BMPs and protect water quality:
  - Slash-filter windrows will be constructed on the approach fills.
  - Filter-fabric fences will be in place downstream prior to and during culvert installation.
  - Diversion channels will be constructed and lined with plastic to divert streamflow prior to any in-channel operations.
  - Except for the equipment used to construct a stream crossing, equipment in streams is prohibited. Equipment used for constructing the crossing will be limited to no more than 2 crossings.
- Brush will be removed from existing road prisms to allow effective road maintenance. Improved road maintenance will reduce sediment delivery.
- The contractor will be responsible for the immediate cleanup of any spills (fuel, oil, dirt, etc.) that will affect water quality.

- Fuel-leaking equipment will not be permitted to operate in stream-crossing construction sites.

- Included in the project proposal are pertinent recommendations of the Flathead Basin Forest Practices, Water Quality and Fisheries Cooperative Program Final Report.

The following numbers correspond to the numbering of recommendation items contained within the aforementioned document, included in pages 154 through 162 of the final report:

1) BMPs are incorporated into the project design and operations of the proposed project.

2) Riparian indicators will be considered in the harvest unit layout.

3) Management standards of the SMZ Law (75-5-301, MCA) are used in conjunction with the recommendations of the study.

4) The BMP audit process will continue. This sale will likely be reviewed in an internal audit and may be picked at random as a Statewide audit site.

7) SMZs will be evaluated as a part of the audit process.

12) Watershed-level planning and analysis are complete. Logging plans of USFS, as reported to the Cumulative Watershed Effects Cooperative, are used.

15) DNRC will use the best methods available for logging and road building for this proposal.

17) DNRC requested inventory information from DFWP. DNRC's mitigation plan for roads fits all recommendations for "impaired streams". Using "worst-case-scenario" criteria provides for conservative operations in this proposal.

18) Provisions in the Timber Sale Agreement address BMPs that are rigidly enforced.

29-34) DNRC has cooperated with DFWP for continuing fisheries work. DNRC will continue to monitor fisheries in the future as funding allows.

GRIZZLY BEARS

The following items are incorporated into this proposal:

- Contractors will be required to haul or store garbage in a safe place so bears will not be attracted to the area.

- No logging camps would be allowed in the sale area unless approved by the Forest Officer.

- The Forest Officer will immediately suspend any or all activities directly related to the proposed action, if necessary, to prevent imminent confrontation or conflict between grizzly bears and humans or other threatened or endangered species and humans.

- huckleberry (*Vaccinium sp.*) patches will be avoided during mechanical scarification, when possible.

- Contractors will be prohibited, while working under contract, from carrying firearms into areas where roads are closed.

WOLVES

A contract provision will be included to protect any wolf den or rendezvous site within the gross sale area that may be discovered during implementation of this proposal.

BIG GAME

Existing vegetation along open roads will be retained in harvest units to increase security by reducing road impacts to big game species.

WILDLIFE TREES AND SNAG RETENTION AND RECRUITMENT

- High-quality wildlife trees/snags, such as large, broken-topped western larch, will be designated for retention and given special consideration to prevent loss during yarding operations.
- Some large western larch (greater than 18" dbh) with characteristics that indicate they could become high-value snags (stem rot or physical defects) will be retained.
- Some clumps of larger grand fir that have stem rot will be retained to provide nesting habitat.

TOWNSEND'S BIG-EARED BAT

If any large aggregation of bats is discovered during the preparation or administration of this sale, the DNRC wildlife biologist will be informed immediately. Depending upon the nature of the report, the biologist will then coordinate efforts to determine the species. If Townsend's big-eared bats were determined to be present, further mitigative measures will be developed.

ROADS

- Information on road-construction activities and road use associated with road-construction activities will be relayed to the general public.
- BMPs will be incorporated in all planned road construction.
- Signs will be placed at some critical intersections.
- See the *EROSION* section.
- Under the action alternatives, segments of some existing roads will be closed by sign or physically closed during harvesting activities for safety reasons.

VISUALS

- Damaged residual vegetation will be slashed.
- The location, size, and number of landings will be limited.
- Disturbed sites along road right-of-ways will be grass seeded.
- Pockets or strips of the residual stands along topographic breaks and roadsides will be retained to limit views into harvest units.

ARCHAEOLOGY

- A review of the project area was conducted by a DNRC archaeologist.
- A contract clause provides for suspending operations if cultural resources are discovered; operations may only resume as directed by the Forest Officer.
- If cultural resources were discovered, the Confederated Salish-Kootenai Tribe has requested notification.

SOILS

COMPACTION

- Logging equipment will not operate off forest roads unless soil moisture is less than 20%, frozen to a depth that will support machine operations, or snow covered to a depth that will prevent compaction, rutting, or displacement.
- Existing skid trails and landings will be used where the design is consistent with prescribed treatments and meets current BMP guidelines.
- Designated skid trails will be required where moist soils or short steep pitches (less than 300 feet) may not be accessed with other logging systems. This will reduce the number of skid trails and the potential for erosion.

- Where designated skid trails are required, timber on the trails will be felled and skidded before the remaining timber in a harvest unit is felled. This will define felling patterns, facilitate skidding on designated trails, and reduce the harvest unit area impacted by skidding equipment. Skidding plans are required to be in place prior to the start of logging operations.

- Skid-trail density in a harvest area will not exceed 15% of the total area.

SOIL DISPLACEMENT

- To prevent the displacement and erosion of topsoil, hard-tracked ground-based skidding equipment will not be operated on steep slopes (greater than 40% sustained over 300 feet). As an alternative for steeper slopes and excessively wet soils, soft-track equipment (or equivalent) would be used.

- Brush piling with dozers requires use of an approved brush rake.

- Designated skid trails will be required in all areas where tractor yarding is proposed. Existing skid trails will be used when possible.

- Woody debris would be retained on site for nutrient cycling.

EROSION

- Ground-skidding machinery will be equipped with a winchline to limit the equipment-operation areas.

- Roads used by the purchaser will be reshaped and the ditches redefined following use to reduce surface erosion.

- Drain dips and gravel will be installed on roads, as needed, to improve road drainage and reduce maintenance needs and erosion.

- Some road sections will be repaired to reduce erosion potential and maintenance needs.

- Applications of certified weed-free grass seed and fertilizer will be applied in a timely manner to all reconstructed road surfaces and cut-and-fill slopes. Applications will also be applied to any existing disturbed cut-and-fill slopes and landings immediately adjacent to open roads. This will be done to stabilize soils and reduce or prevent noxious-weed establishment. This will include:

  - seeding all road cuts and fills concurrent with reconstruction;

  - applying "quick-cover" seed mix within 1 day of work completion at wet-culvert installation sites; and

  - seeding all road surfaces and reseeding culvert installation sites when the final blading is completed for each specified road segment.

- As directed by the Forest Officer, water bars, logging-slash barriers, and, in some cases, temporary culverts will be installed on skid trails where erosion is anticipated based on ground and weather conditions. These erosion-control features will be maintained and periodically inspected throughout the contract period or extensions thereof.

AIR QUALITY

The first item is designed to prevent individual or cumulative effects during burning operations. The next 2 items are designed to reduce effects from burning operations.

- Burning operation will be in compliance with the Montana Airshed Group reporting regulations and any burning restrictions imposed in Airshed 2. This will provide for burning during acceptable ventilation and dispersion conditions.

- Dozer, landing, and roadwork debris will be piled clean to allow ignition to occur during fall and spring when ventilation is good and surrounding fuels are wet. The Forest Officer may require that piles be covered. Covered piles are drier, ignite easier, burn hotter, and extinguish sooner due to higher relative humidity during spring. This would reduce dispersed (unentrained) smoke.

- In order to reduce smoke production, the number of burn piles would be minimized by leaving large woody debris on site.

- Dust abatement may be applied on some segments of Upper and Lower Whitefish roads that are used during hauling, depending on the harvest season and level of public traffic.

FIRE HAZARD REDUCTION

- Smaller fuels should be piled to reduce fire hazards and would be burned within a 1-year period.

- Additional broadcast burning may be done to reduce fuels and improve natural regeneration potential in specific locations.

- Residual logging slash and tops would be lopped and scattered (usually to within 24" of soil surface to improve the rate of decomposition.

NOXIOUS WEED MANAGEMENT

- All tracked and wheeled equipment will be cleaned of noxious weeds prior to beginning project operations. The contract-administrating officer will inspect equipment periodically during project implementation.

- Prompt vegetation seeding (with a native grass seed mix) of disturbed roadside sites will be required. Roads used and closed as part of this proposal will be reshaped and seeded.

HERBICIDES

To further limit the possible spread of weeds, the following integrated weed-management mitigation measures of prevention and control will be implemented:

To reduce risk to aquatic and terrestrial resources, the following will be required:

- Compliance with laws, rules, and regulation of the State of Montana and Flathead County Weed District.

- All applications will adhere to Montana's BMPs and the herbicide's specific label guidelines.

- Herbicide application will not be general, but site specific, to areas along roads where noxious weeds are occurring. All no-spray areas will be designated on the ground before applications begin.

- Herbicides will not be applied to areas where ditch-relief culverts may contribute runoff directly into surface water.

- Application will be applied on calm, dry days to limit drift potential.

HELICOPTER LOGGING

- The number and size of landings will be kept to a minimum.

- Landings will be located in existing openings from previous harvesting activities and wide openings along roads. Landings from previous harvests will be used when possible.

- Service landings will be located in areas to protect water quality. A spill plan for fuel containment that meets HAZ/MAT Specifications will be required.

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